ORDER NO. MNS007

NATIONAL

Service Manual

VIDEO TAPE RECORDER

MODEL **NV-1020N**

MODEL **NV-1020E**

MODEL **NV-1020ED**

<EXPORT DIVISION>
MATSUSHITA ELECTRIC TRADING CO., LTD.
P. O. Box 288, Central Osaka, Japan

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
VIDEO TAPE RECORDING DEPT.

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INTRODUCTION

NATIONAL through its unending research and development in video recording techniques produced the precision commercial video tape recorder. This experience culminated in the models, NV-1020 and NV-1020E using MATSUSHITA ELECTRIC'S highly developed electronics and mechanical technology.

Audio recording magnetic tape theory is well known by service technicians. The electrical circuitry and mechanical design used are common knowledge in the industry today.

Video recording on magnetic tape requires much precise construction of the transport mechanism to minimize wow & flutter because of the frequencies involved in pitcutre recording (0 to over 3 MC) compared with audio frequency requirements of 40 to 15,000 cycles per sec.

To maintain tape speed at a nominal value of 30.3cm (CCIR: 24.5cm) and obtain a high writing speed, the video heads are rotated by a servo-controlled motor and the tape is moved 180° around a drum at an angle. This system is called helical scan.

Frequency modulation of the video signal on a carrier is employed, allowing direct recording of the modulated carrier, thus eliminating a broad frequency compensating network and a bias signal circuitry.

This manual has been prepared with the intention of providing complete product reference and technical information for the NATIONAL video tape recorder.

Use this manual along with the Monitor TV and TV Camera service manual. They will provide the service technician with a more thorough technical and practical background and enable him to offer timely and satisfactory field and shop service to his customers.

VIDEO HEAD

The relative tape speed against the head of the NATIONAL VIDEO TAPE RECORDER is approx. 12.3m (CCIR: 10.2m) per second and to obtain this high speed, a rotating magnetic head assembly, in which a pair of magnetic heads located at opposite sides of the circumference, is provided. The head assembly is rotating at a speed of 1,800 rpm (CCIR: 1,500 rpm) and along the half of the circumference of the head rotation, the magnetic recording tape is in contact. (Refer Fig. 1)

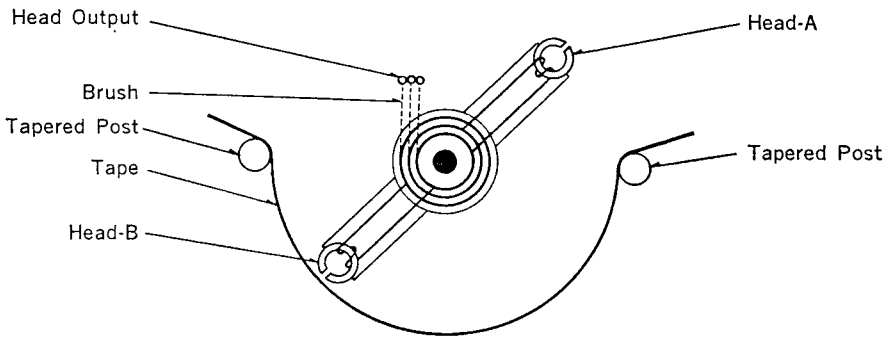


Fig. 1

Immediately before head-A is in contact with the tape, head-B is disengaged from the tape. The recordings are made helically on the tape as shown in Fig. 2. The tape itself is moving at a speed of 30.3cm (CCIR: 24.5cm). The audio signals are recorded with AC bias current, at the top edge of the tape. At the bottom edge of the tape, a control signal, which synchronizes the rotating speed of the head against the vertical sync. signal in the signal, is recorded.

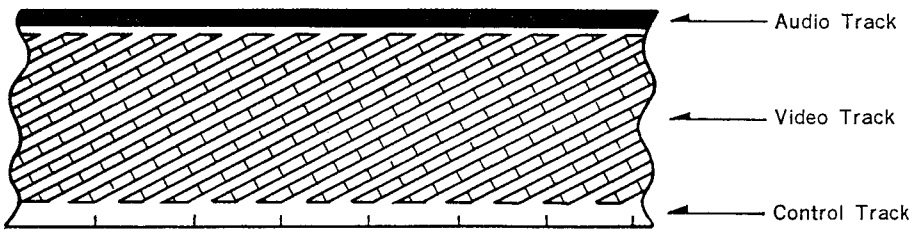


Fig. 2

When reproducing, the video, audio and control heads pick up the previously recorded signals on the tape. To do this precisely the servo mechanism is necessary.

The operating principle of the VTR and the regular Audio Tape Recorder is identical. The operating theory of the audio and video head is identical.

The construction of the head is as shown in Fig. 3. It is composed of a core made of a material which has high permeability, the coils and the gap. When a current is fed into the coil, a magnetic field is formed which magnetizes the magnetic oxide coated on the recording tape. When reproducing, the magnetic field on the tape induces currency in the coil and the recorded signals are reproduced.

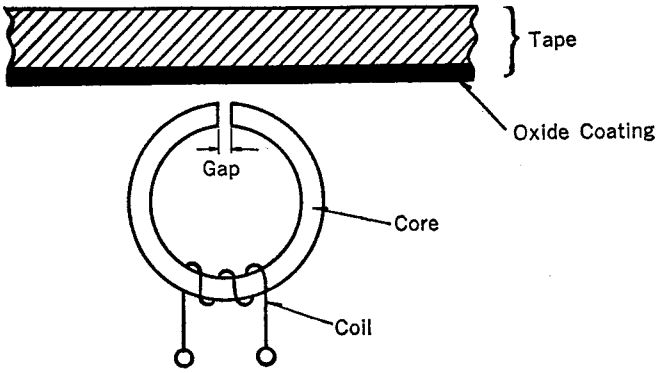


Fig. 3

When the tape speed is constant, it is logically possible to record up to the high-end frequency by narrowing the gap of the head. However, if the gap is made too narrow, it tends to cderease the reproduction efficiency, because of the existence of small space between the tape and the head. Generally, the gap of an audio tape recorder is approximately 5 microns which enables it to record frequencies up to 20,000 cps. However, in video recording, the high-end frequency is at least 3 MC which is 150 times of that of the refgular audio tape recorder. It requires a head gap as narrow as 1 micron and at the same time requires the high relative tape speed against the rotating head.

The reproducted power output is reduced when the frequency to be recorded becomes higher and the loss in the output is in direct proportion to the frequency wave length (λ). One of the most essential factors for creating the loss of output is friction space (d) between the tape and the head. The relation among the Space Loss, (λ) and (d) is expressed in the function as shown below;

$$\text{Space Loss} = K\frac{d}{\lambda}\,(\text{dB})$$

As obvious from the function above, when the frequency is higher, the wave length is shortened and the output loss increases.

As expressed in the another function below showing the relation of tape velocity (V), wave length (ω) and frequency (f), the tape speed has a cue to the S/N ratio of the picture quality.

$$f = \frac{V}{\lambda} \qquad \therefore \quad V = f\lambda$$

As minimum level of video signal to be recorded marks 3 MC and its wave length is 3λ sec., the necessary speed of tape has to be 9 m/sec. which assures the minimum standard of picture quality.

To record the audio signals on the tape, in the early days, recording with DC bias or no bias current was adopted but now most audio tape recorders use AC bias for recording. With the AC bias recording system, noiseless, distortion-free and linear recording is obtained.

When recording the FM waves of the video signals, the recording is not made by the amplitude of the waves but it uses the non-bias recording system and records the frequency change.

The video head is subject to the accumulation of the residue of the tape oxide and dust during usage which, of course, degrades the record and reproduction quality. To remove these a brush, or gauze, etc, are to be used.

The life of the head is subject to the material of the head, construction of the head, kind of the tape as well as the operating conditions. The tape holdbakc tension, surface roughness of all tape guides and dust when using, are factors controlling video head life.

The biggest merit of the magnetic video recording is the fact that the recording can be erased for another recording. In order to erase the recording, two methods are available (DC and AC erasures). Generally, the noise and distortion are greater in case of the DC erasure.

The AC erasure is (as shown in Fig. 4) made with the ring-type head which is supplied with a large current of high frequency and brings the recording tape to the saturation point "A". The erasure is made immediately before the recording is made. The erasing magnetic field gradually decreases as the tape moves away from the head so that the magnetic field cycles many times. As shown in Fig. 5, the magnetization will be decreased from A-B-C...and approaches to the neutral point "0" and finally becomes zero.

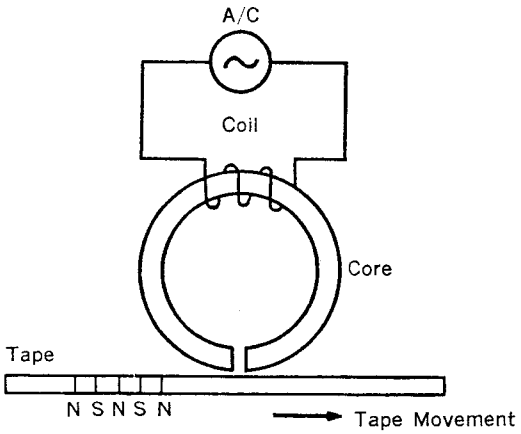


Fig. 4

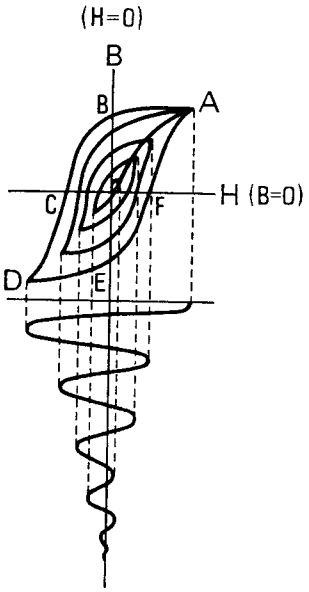
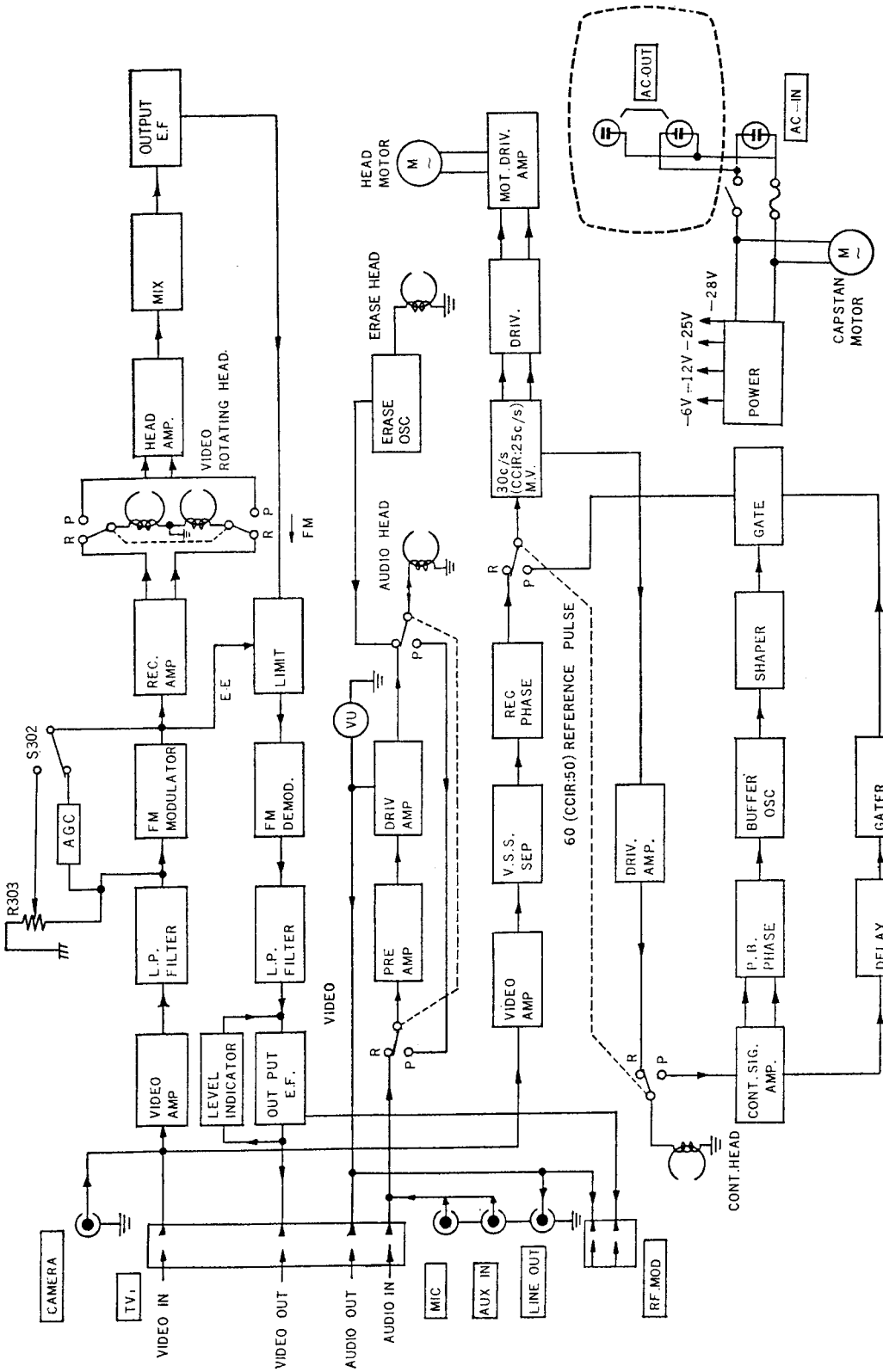


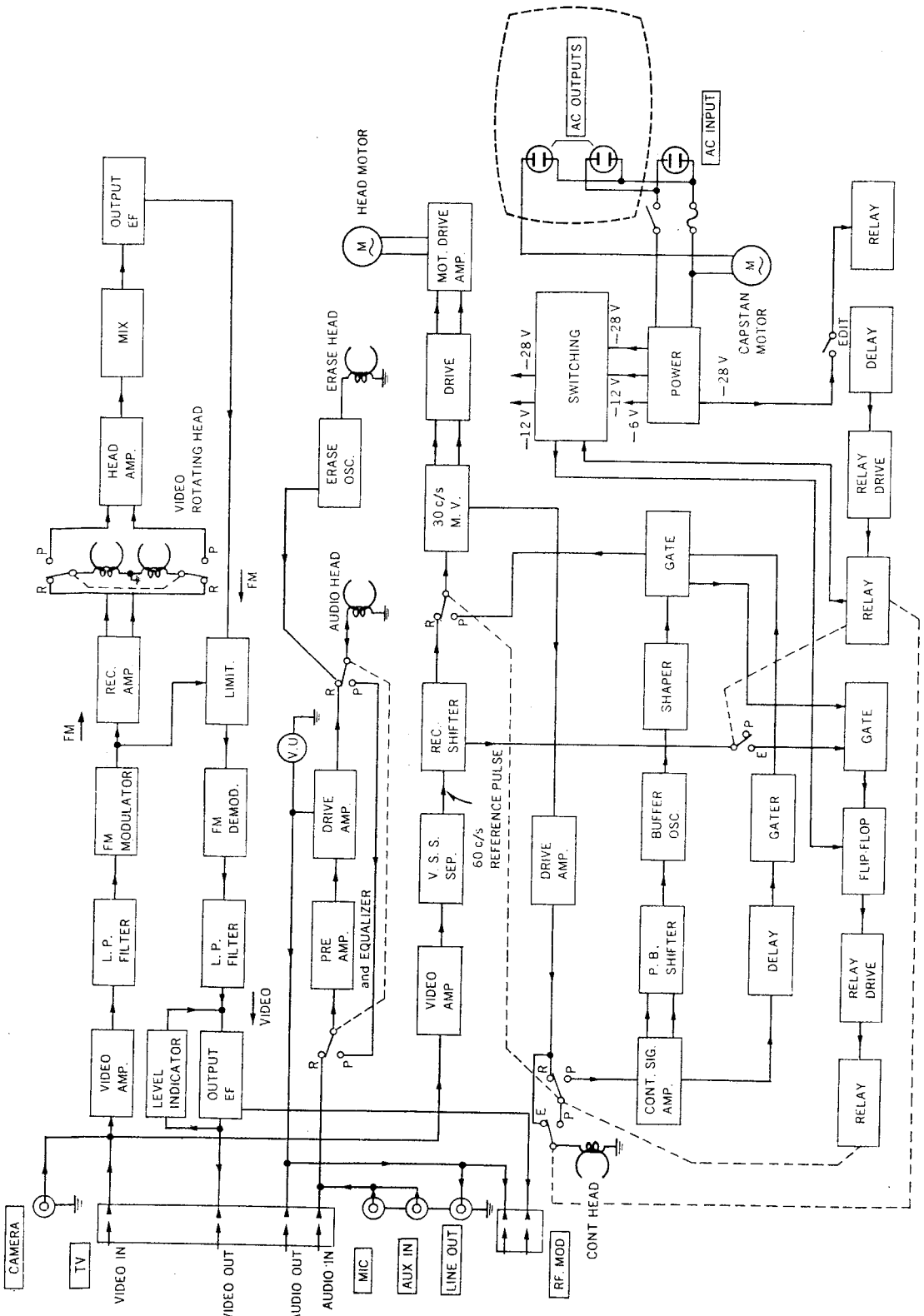
Fig. 5

BLOCK DIAGRAM FOR NV-1020N/E



NOTE: AC-OUT surrounded by dotted line are not provided with CCIR type set.

BLOCK DIAGRAM FOR NV-1020ED/D



VIDEO CIRCUIT

The block diagram is shown in Fig. 6. The input of the video signal is obtained either from a monitor television or the televison camera and will be reproduced on the monitor screen. The input of audio signals is obtained either from the monitor television or a microphone or the line output terminals provided on the sound source epquiment and can be reproduced either through the monitor television or an external amplifier connected to the line output jack on the recorder.

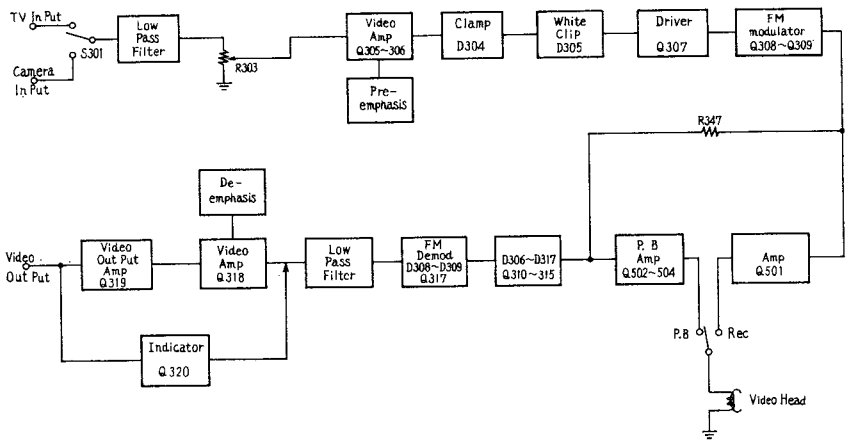


Fig. 6

The image passing only through the video modulation and demodulation circuits (not through the head and the tape) is called "E-E" system image while the actual reproduced image, which passes through the video modulation and demodulation circuits as well as the head and the tape, is called "V-V" system image.

The video modulation circuit is composed of the Common Base Amplifier, Low-Pass Filter and the FM Modulator. The video polarity of the Common Base Amplifier is the same both for the inpuut and the output signals. A multivibrator is used as the FM modulator. The video signal changes the base current, thus generating Frequency Modulation.

The frequency of the FM modulator changes according to the modulating wave and the maximum frequency range is called "Deviation". Although the S/N ratio of the reproduced image improves as the Deviation becomes wideer, the range of the deviation is limited by the band-width of the head and tape systems. If the modulation is excessive the white lievel of the input video signal will appear as black on the reproduced image. The wave form of the modulator output without the modulating wave must be a nearly perfect square wave. This is called "modulation balance". If it is unbalanced, a beat oscillation will be created in the E-E mode.

The modulator output is fed to the video recording amplifier through the driver transformer.

The video demosdulation circuit is composed of a limiter, FM demodulator, Low-Pass Filter, Emitter-Follower amplifier and the Level indicator circuits. The Limiter (as shown in Fig. 7), holds the amplitude of output from the head pre-amplifier (i.e. input signal to the limiter) constant by clipping it at the center of the wave form and eliminates the noise contained in the output.

The characteristics of the diode (as shown in Fig. 8) is; to increase resistance at low voltage and permit an avalanche current with higher voltage. If two diodes are connected with opposite polarity, the internal resistance at about zero-volt is large, but it tends to decrease over certain positive or negative voltages. These diodes are connected between the collector and the base of the amplifier. The amplifier has a negative feedback above a

When the input level is increased, innevitablly the input signal for Q301 increases with the output level of WQ301 and Q303, inducing the rise in the output level of the peak voltage detector, and causes the output increase in the negative voltage of the emitter of Q304 converted in impedance. The negative bias currenct for D301 might accordingly be augmented to increase its resistance and the feedback voltage of Q301 offsets the input amplitude for the desired balance of Q303 output level. When the input level is decreased on the contrary, the counter result may take place for stabilizing the output level.

For optimizing the linearity of the diode, the resistors R304 and R305 attenuate the input level to have the circuit operated in the low level of voltage.

VIDEO AMPLIFIER & PREEMPHASIS: Q305 Q306

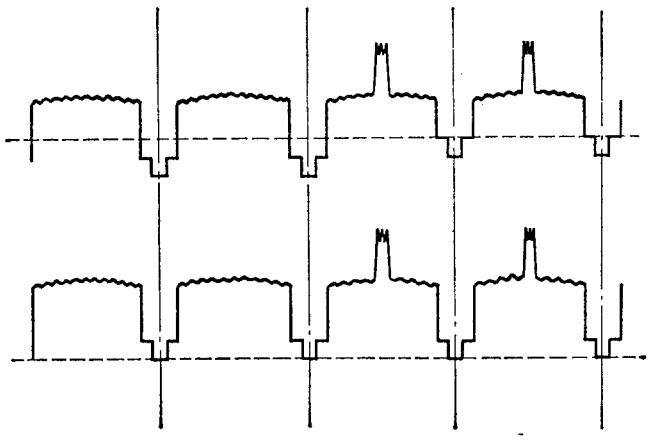
Composed of a pair of amplifier to amplify the input voltage for driving the modualtor. By adopting the negative feedback circuit of C318 and R324, frequency response is much improved. The coil L304 clips off the negative feedback voltage in the higher portion of the frequency resulting in upgrading the over-all gain of the pre-emphasis circuit.

CLAMP CIRCUIT: D304

Video signal is the composite wave format of sync signal and video signal which is congenial with direct current. The average level of the video signal changes according to the specific level of the composite signal. When the signal is driven into the modulator without reforming the waveform, some unfavorable ups and downs are noticed in the modulator on each portion of sync tip, pedestal and white peak configurations (Refer to Fig. 12). Frequency modulation stays stabilized by connecting the clamp leveler C319 and D304 (Fig. 13).

Fig. 12

Fig. 13



WHITE CLIP CIRCUIT: D305

The driven video signal in this portion has been pre-emphasised specially in high frequency which tends to over-modulate in the front and final porch of the waveform. The picture appears to be solarized in the playback mode. This circuit plays a roll to clip the rising white level of the frequency at a certain voltage. The diode D305 negatively-biased by R335 is put on only when the signal is driven beyond the rated level and clips the over-modulated white signal.

MODULATION DRIVER: Q307

Composed of Emitter Follower circuit which receives the high impedance signal driven by the diodes in the Clamp and White Clip circuit, and which has the modulation circuit driven in the low impedance through the driect current connections.

FM MODULATOR: Q308, Q309

FM modulator is built up with the free running multi-vibrator in which the frequency is controlled by the base voltage regulated with the signal voltage. The combination of R343 and C324 forms a waveform balancer to obtain well-balanced symmetry in the modulated frequency waveform. The frequency is output through a symmetry transformer and driven into the recording amplifier. Amplitude of frequency modulation should be adjusted for the range between the sync tip and white peak signals.

E-E SYSTEM :

The circuit in which some portion of FM signals are distributed into the limiter circuit for reproducing the signals on the monitor TV receiver in the record mode (E-E stands for Electronics-to-Electronics).

RECORD AMPLIFIER: Q501

Record amplifier drives the video head by feeding recording current into the heads for recording on the magnetic tape. The relationship between the input and output of the video heads exhibits the curve as shown in Fig. 14 and 15.

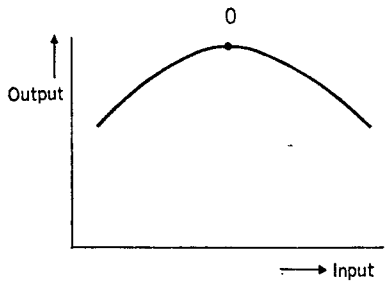


Fig. 14

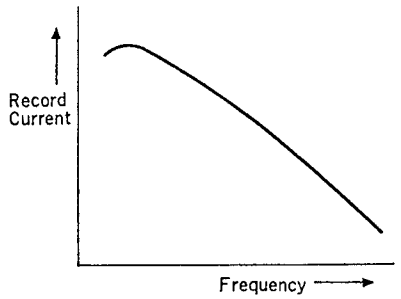


Fig. 15

The optimum recording current for the maximum playback output needs to be at 0 point in the figure 13, which may vary according to the tape-to-head speed, head gap length or the material bonded on the tape, etc, and the recording current tends to decrease as the frequency shows a rise.

The recording current should be determined at the amplifier side of T501 with the voltage waveform reformation at TP501 (the arms of R511).

P.B AMPLIFIER: Q502~504

The amplifier circuit should be designed in the most effective way to pick up the informations recorded on tape. During playback mode, each of the two video heads detects the taped signal feeding the separate RF signal to the mixing transformer T501.

The equalizer control is provided to permit equalization and obtain proper signal frequency response. With this control compensation is made for any loss incurred during the record and playback processes. Adjustment is made for the flattest response consistent with the best signal-to noise ratio.

LIMITER: Q310~315

The video FM signals are routed to the six-stage limiter before they are demodulated because they include various noises caused by level fluctuations due to inconstant head-to-tape contact, unwanted signals or an incorrectly reproduced side-band. The limiter serves to reduce undersirable level fluctuations.

The circuit works as an amplifier when the signal voltage appeared at the collector of the transistor stays within the rated voltage of positive direction of the diode.

At the instance voltage at the collector overwhelms the rated voltage of the diode, the diode is shortened to feed the negative signal to the base with remarkable gain decrease and results in amplitude clipping of the waveform. The potentiometer R354 is equipped for producing symmetrical square waves in the circuit.

FM DEMODULATOR: D308, 309, Q317

The FM Demodulator is pulse defferential utilizing the spuare wave signal fed out of the limiter output (See Fig. 16).

The waveform (1) shows the output signal from the limiter circuit, which is differentiated by T302 transistor form the negative and positive pulse wave (2) of stable amplilude.

Rectifying the wave signals into the dense pulses as shown in (3), the signal is demodulated into the waveform as shown in (4) by tracing average level of each pulse via low pass filter (differential circuit).

The symmetric waveform must be obtained to minimize the carrier leakage, which might be reduced by the sharpened range of the low-pass-filter.

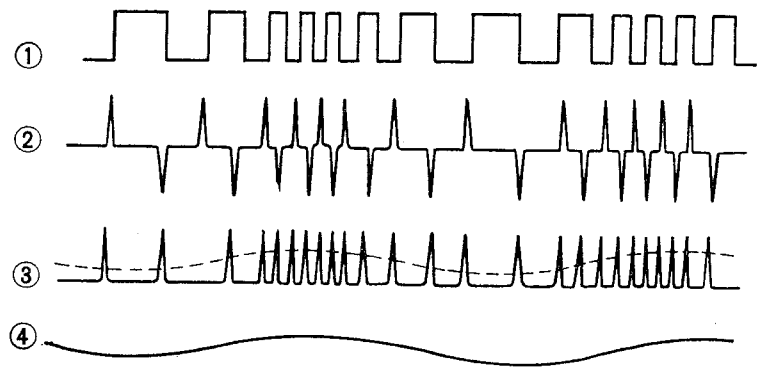


Fig. 16

LOW-PASS FILTER:

The filter circuit is so designed as to eliminate the carrier leakage by narrowing the frequency range. which may detriment the horizontal resolution if the range is determined too narrow.

VIDEO AMPLIFIER: Q318

Demodulated signal is stepped up by the amplifier for the needed level. The output level is adjusted by the resistor R372. The output of the mixing circuit is de-emphasized by the Q318 Emitter R376 and L311 components.

VIDEO OUTPUT AMPLIFIER: Q319

The amplifier is designed to supply the video signal to the external monitor TV usually connected with a 75 Ω coaxial cable. Therefore, the output impedance has to be lower and the outlevel may need 1 Vp-p minimum for optimum performance. The coupling capacitor (C348) is resulted in the large capacity of 1000 μF.

VIDEO LEVEL INDICATOR: Q320

The stable level of modulation is needed to maintain optimum playback performance. The video level indicator circuit is necessitated for the above reasons. The level is indicated in the electronics to electronics (E-E) picture in the record mode so that the operator can view the level. The optimum level is determined by the picture that shows maximum output level before the picture appears to be overmodulated.

This system has major advantages over the meter indication system in giving high sensitivity with the lowest distortion.

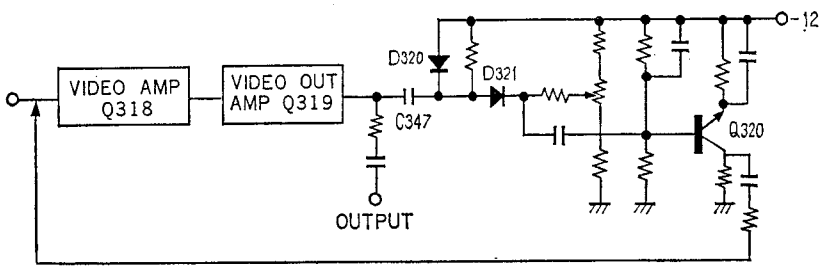


Fig. 17

The emitter of video amplifier showing the negative sync pulse, needs to be clamped at —12 volts with C347 and D320 as below (Also refer to Fig. 17).

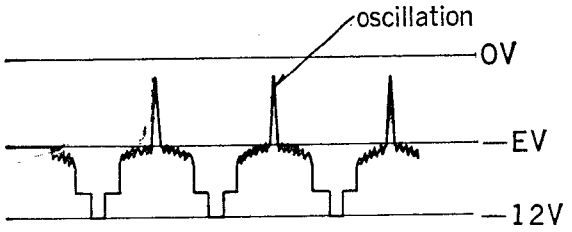


Fig. 18

The signal above is fed to D321 diode gate of which the direct current —E volt is fed to the other end resulting in reverse bias of the diode permitting no signal transpassed when the tip voltage level is rated within the value —EV. At the instance the tip level ekceeds —EV. the diode D321 is shortened to allow the exceeding voltage passed the diode, amplified in reverse amplitude and routed back to the base of Q318 positively giving the oscillation to the output waveform to show the overmodulation in the E-E picture.

NOTE:

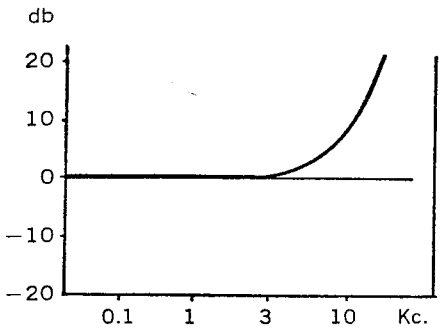
The model NV–1020 EN is sometimes equipped will AGC (automatic gain control) circuit. Confirm before adjustmert whether the recorder is facilitated with AGC circuit.

AUDIO CIRCUIT

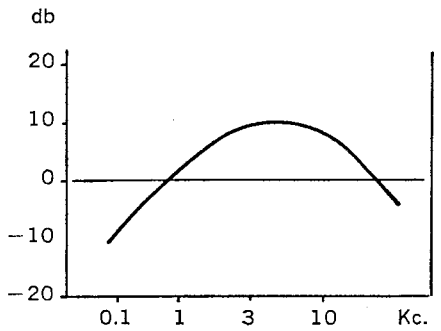
When recording video signals, the audio signals are recorded at the top edge of the recording tape (approximately 1 millimeter width) and one head is used for both recording and reproduction. In order to obtain good quality sound recordings, an AC bias system is used.

EQUALIZATION

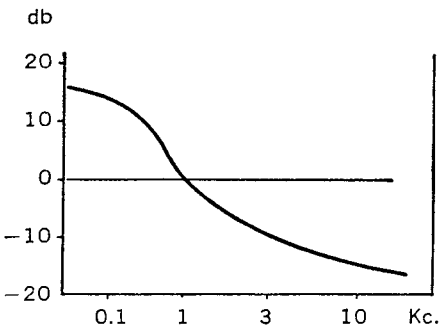
When recording, series resistors having a resistance value relatively high in comparison to the reactance of the recording head are used to provide a constant current regardless of frequencies making the magnetization in direct proportion to the level of the signal. This is called constant current recording. In reproduction the reproduced output increases in proportion to the frequency when it is relatively low in comparison to the magnetic pole gap of the head, but it decreases abruptly when the frequency becomes high because of the self demagnetizing effect and the gap loss. To maintain an even frequency response, it is necessary to boost the high frequencies in recording and boost low frequencies in reproduction. (Refer to Fig. 19)



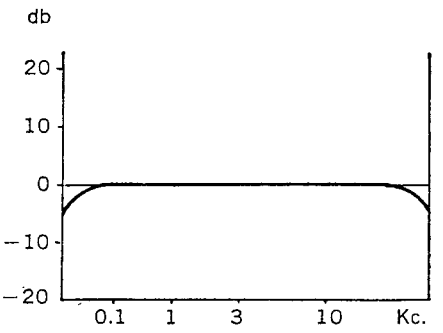
(A) Frequency Response of Rec. Amp.



(B) Frequency Response of Head



(C) Frequency Response of Playback Amp.



(D) Overall Frequency Response

Fig. 19

LEVEL INDICATOR

If the amplitude of the recording signal is excessively large, the distortion tends to increase. On the other hand, if the signal level is too small, it decreases the S/N ratio. In order to control the recording signal level, an audio level indicator is provided on the unit.

ERASURE OF SIGNAL

When the recorder is set in the Record mode, the signal previously recorded on the tape (audio, control and video signals) are erased (AC erasure) automatically before reaching the video, audio and control recording heads.

AUDIO CIRCUIT DESCRIPTIONS

(See NOTE for AGC on Page 15)

TV-CAMERA INPUT SELECTOR: S301-2

The selector placed at TV side accesses the audio input signal from the monitor TV receiver into VTR. When placed at CAMERA side actuates MIC input (J401) or AUX input (J402) connector for recording.

MAN-AGC SELECTOR: S302-4~302-6

The switch S302–4 shortens the AGC control transistor Q401 when set for the manual level operation.

The switch S302–5 drives the output signal into the selected circuit (AGC or manual mode) for level meter reading.

The switch S302–6 actuates the audio level control R403 when set at MAN side.

RECORD-PLAYBACK SELECTOR RELAY: S401-1~S401-4

The selector S401–1~S401–4 equipped with two contacts for four circuits is activated by direct current −24 volts, which is stepped down from −28 volts supplied for Q407~Q408 transistors in Erase Oscillator circuit.

AUDIO AMPLIFIER: Q402~Q405

Transistors Q402 through Q405 amplify input audio signal for Q403 transistor of which the collector feeds back the negative pulse of frequency response to the emitter of Q402 transistor. This characterizes the following response to the given frequency especially in the playback mode (See Fig. 20).

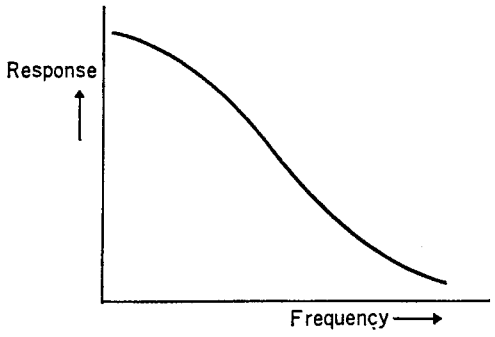


Fig. 20

AUDIO LEVEL METER AND AGC CIRCUIT: Q406~401, D401~402

Q406 modulates impedance to utilize the signal for the level meter amplifier and AGC circuit; the output signal of Q406 is converted into direct current by the diodes D401 and D402 for driving signal of M401 meter and AGC circuit. The negative DC signal is fed to the base of Q401 transistor via S302–5 selector for controlling the collector impedance of Q401 to automatically adjust the input level.

PLAYBACK GAIN CONTROL: R423

The resistor R423 to adjust the playback gain control.

BIAS TRAP CIRCUIT: L401, C415, L402, C423

Bias signal leakage in AC bias recording method is eliminated by the series resonant trap circuit composed of L401 C415 and L402 C423 components.

BIAS AND ERASE OSCILLATOR: Q407, Q408

The push-pull circuit consisting of Q407 and Q408 oscillates 70 KHz frequency for AC bias recording and erasing.

IMPORTANT NOTICE

NATIONAL video tape recorder of one-half inch tape format is added to its original functions the AUTOMATIC LEVEL CONTROL feature which enables the automatic level adjustment of both video and audio signals for the optimum recording without any distortion in the picture and sound quality.

Please follow these instructions given below for the model now in your hand.

1. For the models;

NV–1020E
NV–1020E–1
NV–1020E–3
NV–1020ED
NV–1020ED–3
NV–1050E
NV–1050E–3

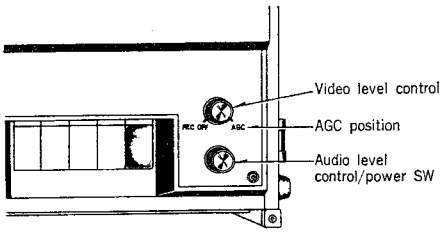


Fig. 21

These models are equipped with the AGC(automatic gain control) both for video and audio signals.

Turn the video control clockwise to "AGC" position (turn until the click is heard). This position enables the optimum recording without adjusting the level control manually.

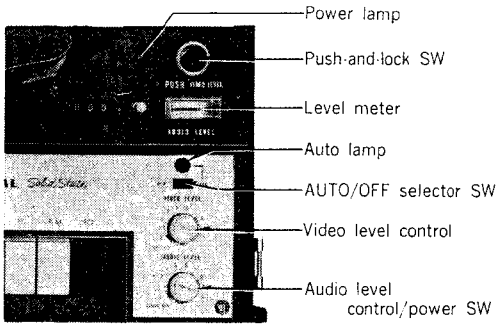


Fig. 22

2. For the models;

NV–1020E–2
NV–1020ED–2
NV–1050E–2

a. The selector switch is provided with the recorder for selecting automatic level control both of video and audio signals, or manual control operations. When the selector SW is placed at "AUTO" side, the recorder is able to operate for optimum recording without adjusting the level control knobs. When placed at 'OFF' side, the recording levels of both the audio and video controls have to be adjusted for the optimum level.

b. In addition, the level meter of audio level indication can be switched to the video level indication when the push-and-lock type switch located close to the meter is pushed. Adjust each of the level refferring to the level meter respectively when required.

These features mentioned above are quite useful even when the monitor TV is not available. Confirm the playback picture on the conventional TV receiver by using the RF converter optionaly provided from the authorized NATIONAL sales of the local agent.

CONTROL CIRCUIT

A rotating two head system is adopted in this equipment. In order to record the video tracks on the recording tape with a constant slant, pre-determined inclination is given to the video head tracking on the tape, and the locus of the video head on the recording tape is obtained as shown in Fig. 23.

On the tape, as shown in Fig. 21, the three different locuses are found, the video track to record the video signals, the audio track to record audio signals and the control track to record the control signal to control the locus of the video head.

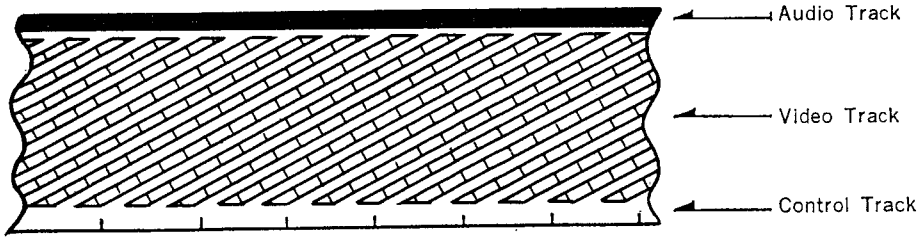


Fig. 23

A pair of video heads are mounted 180 degrese apart on a motor called "head disc motor". Controlling of the video head means controlling the head disc motor. There are two ways to control the head disc motor. One is called a "servo system" which controls the head disc motor rotating phase of the motor and the driving signal of the motor. The other is called "direct driving system" and is used in this unit. A synchronous motor which synchronizes its rotation to the driving signal is used.

Fig. 24 is the comparison of these two systems. The direct driving system is much simpler than the servo system. The head disc motor is rotated at a speed of 1,800 rpm (CCIR: 1,500 rpm) and it synchronizes with the vertical sync. In the television signal and the contacting period of a head against the tape becomes 1/60 sec (CCIR: 1/50 sec). In recording it is necessary to drive the head disc motor by this vertical sync signal. Noise is unavoldably created at the moment of head switching. If this noise appears in the image, it is distorted, so to eliminate this problem it is necessary to adjust the timing of the switching period a few lines of horizoatal scanning above the vertical blanking portion of the television signals.

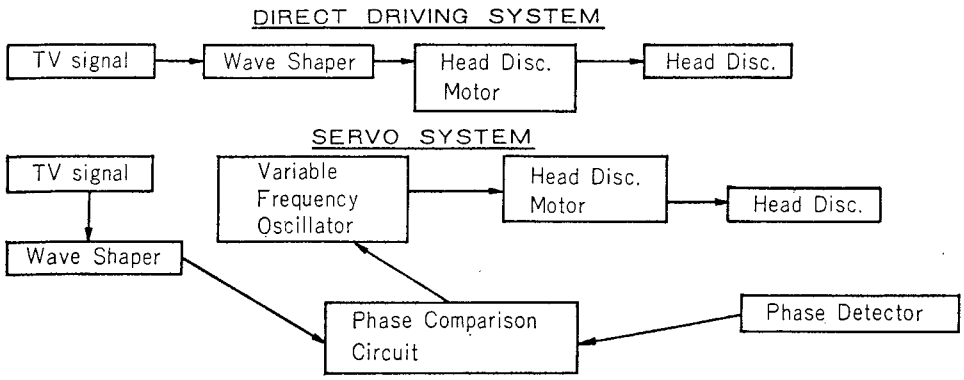


Fig. 24

In reproduction the operation is identical to recording. The locus recorded by the head-A must be traced by head-A in reproduction. This operation is called "head sensing". To perfectly match the locus and the head during reproduction the phase adjustment of the reproduced signal becomes necessary. If the heads are tracing outside of the locus made at recording, it degrades the S/N ratio and the picture quality.

Another important factor in the VTR is the stability of the tape speed. If the tape speed is not well stabilized, not only unpleasing sound will be reproduced, but the control signal in reproduction will be distorted and in the extreme condition the image cannot be distinguished on the monitor screen at all.

The wow and flutter (same as in regular audio tape recorders) are mainly created by the uneven rotation of the reel and the eccentricity of the capstan. When the holdback tension on the supply reel is uneven, this uneven back tension coincides with the rotation of the supply reel and will develop an uneven tape movement.

VTR tolerance in tape movement is more critical than the regular audio tape recorder.

CONTROL SYSTEM

The composition of the control circuit is shown in Fig. 25.

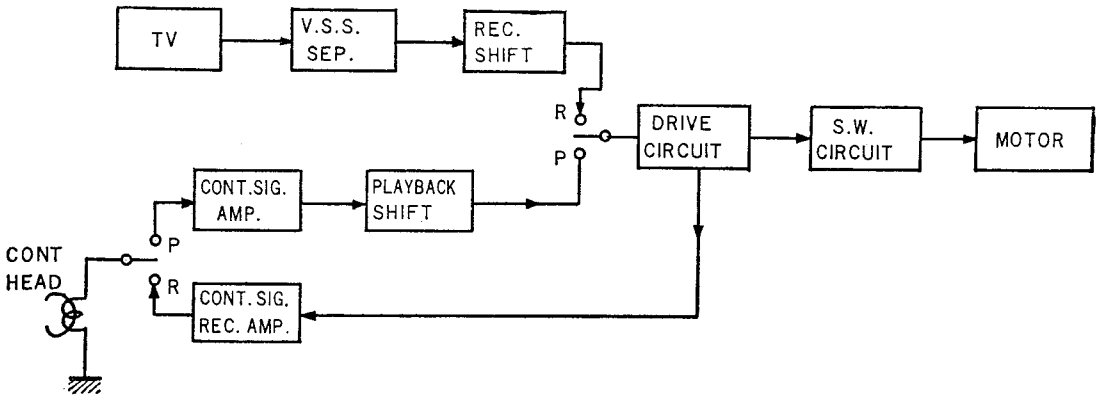


Fig. 25

The circuit that strips the vertical sync pulse from the composite television signals is called "Vertical Sync Signal Separating Circuit" (V.S.S. Sep.) and the head disc motor is controlled by this vertical sync pulse. It is necessary to adjust the phase of the switching time of the video heads a few lines of horizonatl scanning above the vertical blanking portion of the television signals. Although the adjustment of the position of the motor (position of the stator relative to the movement of the recording tape) is possible, it does not permit fine adjustments, therefore the Recording Shifter, which delays the position of the vertical syncl pulse of the television signal, is used in the unit.

The drive circuit supplies the necessary power to the motor in the form of a square wave. When recording, the head disc motor is rotated with a fixed phase relationship synchronous to the television signal. Simultaneously, this signal is fed to the Control Signal Recording Ampilfier and is recorded on the tape. This records the differential wave of the motor driving wave on the control track of the tape to control the rotation of the motor in reproduction.

During reproduction, the head disc motor is controlled by the pulse signal recorded on the control track of the tape which is picked up by the control head. The most important thing in reproduction is to adjust the rotation of the head so that the heads trace exactly the same locus recorded on the tape. In order to obtain the proper tracking and the best S/N ratio, the Playback Shifter is used to adjust the phase relationship between the head disc motor which determines the locus of the video head and the control signal fed out of the control track on the tape.

TO SUMMERIZE THE CRITICAL POINTS REQUIRED IN THE VIDEO HEAD CONTROL SYSTEM:

1. IN RECORDING:
   A. The video head assembly must be rotated synchronous to the vertical sync. signal of the video signal.
   B. The timing of the head switching must be adjusted a few lines of horizontal scanning above the vertical blanking portion of the television signals.
   C. The duty cycles of the motor driving wave must be 50:50.
2. IN REPRODUCTION:
   A. The video head assembly must be rotated synchronous to the Control Signal recorded on the tape.
   B. The head sensing must be possible.
   C. The tracking error must be adjustable.
   D. The wow and the flutter must be removed in the tape driving mechanism.
   E. The duty cycle of the motor driving wave must be 50:50.

DETAILED EXPLANATIONS OF THE CIRCUIT ADOPTED IN THE UNIT:

It is required in the V.S.S. Sep. circuit that the vertical sync. signal must be stripped from the television signal even when the noise is contanied in it and the amplitude of the input signal varies. Therefore, a special consideration is given to the integrated circuit which consists of three stages of amplifiers having dynamic range of more than 0.3 V of input video signal.

Rec. Shifter delays the vertical sync. signal by a certain amount of constant phase and triggers the monostable multivibrator by a positive trigger pulse 60 cps. (CCIR: 50 cps). The timing of the variance is from 2 to 10 milliseconds and is adjustable per the relationship with the mounting position of the motor. This adjustment, however, is only possible when the unit is in the Record mode.

The drive circuit is composed of the Astable Multivibrator, 2 sets of the Direct-coupling Amplifiers and a Push-Pull Switching Circuit.

The self-excited Oscillation Frequency of the Astable Multivibrator is adjusted for 28.5 to 29 Hz (CCIR: 20.7~22.7 Hz) and because the head disc motor is driven by the wave from the Astable Multivibrvtor, wave shaping circuit is added, thus a sharply defined squzre wave is obtained.

When recording, both collectors of the Astable Multivibrators are triggered by the vertical sync. Signal of 60 cps (CCIR: 50 cps) with a certain amount of delayed phase by means of the Rec. Shifter. It works like a Flip-Flop Circuit thus it synchronizes with the vertical sync. signal and its frequency becomes 30 cps (CCIR: 25 cps). Furthermore, in order to set the duty cycle at 50:50 in recording and reproduction, the triggering in recording is obtained from 60 cps (CCIR: 50 cps) as explained above, and the trigger pulse in reproduction is developed with the proper polarity recorded on the tape, by means of a Gate circuit specially added.

The power which operates the switching circuit for the head disc motor is given from this circuit through two pairs of directly connected power amplifiers, thus the switching circuit acts as a push-pull circuit and feeds square wave current to the head disc motor which is connected to the collectors of both transistors and forms a Rotating Magnetic Field. Therefore the two pole synchronous motor is rotating at a speed of q,800 rpm (CCIR: 1,500 rpm), and with the heads placed 180 degrees apart from each other, the contacting cycle of a head against the tape becomes 60 cps (CCIR: 50 cps), and the time when each head contacts the tape is 1/60 sec (CCIR: 1/50 sec). Further, the peripheral angle of these two heads against the tape in contact is only 180 degrees of the full rotation of 360 degrees, or in other words, when head-A comes in contact with the tape head-B is instantaneously disconnected from the tape. This switching, however, creates slight noise on the reproduced image, which is unavoidable. Therefore, the timing of this switching is adjusted a few lines of horizontal scanning above the blanking period in the vertical sync. signal by adjusting the phase of the trigger signal of the Astable Multivibrator by means of the Rec. Shifter.

The Twin-Tee Oscillator is used in this equipment. The sine wave oscillation is generated by this oscillator and its frequency is adjusted for 60 cps. (CCIR: 50 cps). It synchronizes to the outer trigger pulse with some time variable if the grigger pulse is di%erent from the oscillating frequency. Althou ghthe trigger pulse is set for 60 cps. (CCIR: 50 cps), it varies slightly because of the mechanical variance as explained above. The

Twin-Tee Oscillator synchronizes with the average frequency of 60 cps. (CCIR: 50 cps), and it soutput signal does not respond to the trigger pulses having rather fast variance, therefore, is working as a damper for the wow.

Since the output wave form from the Twin-Tee Oscillator is sine wave, it is necessary to shape the wave form by means of Schmitt Circuit. In this instance, the trigger pulse and the output wave from the Schmitt Circuit has a delay of approximately 6 ms (CCIR: 10 ms).

The output from the Astable Multivibrator is considered as the motor driving signal itself, therefore this signal square wave of 30 cps (CCIR: 25 cps) is fed to the control head through the Cont. Sig. Rec. Amp. The duty cycle is 50:50, square wave of 3—5 mA and the recording on the tape is only made of positive and negative pulses of the rising and falling periods.

The following explanations are for the reproduction modes.

CONT. SIG. AMP.:

As explained above, when recording, as shown in Fig. 26, the square wave signal current is fed to the control head, therefore, its di%erential wave forms are recorded on the control track. Because of this, when reproducing, the pulses having negative and positive polarities are reproduced.

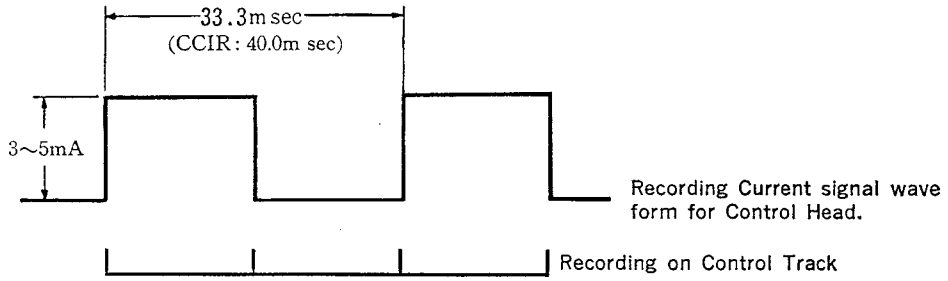


Fig. 26

The Cont. Sig. Amp. consists of a P-N-P transistor and 3 N-P-N transistors. At the first two stages (Class-A) both polarized pulses are amplified and by Class-B at the 3rd stage having P-N,P and N-P-N transistors, in which, the P-N-P transistor changes the negative pulses to positive ones and N-P-N transistor changes the positive pulses to negative ones, as the duration of the negative and positive pulses is 33.3 ms (30 cps) [CCIR: 40.0 ms (25 cps)] and they have 180 degrees of phase difference [16.66 ms (CCIR: 20.0 ms) of timing difference] from each other.

PLAYBACK SHIFTER:

As explained above, it is necessary to sense the pair of video heads during reproduction. In order to keep the duty cycle of the motor driving wave form (Astable Multivibrator) 50:50, it is convenient to use 60 cps (CCIR: 50 cps). The Playback Phase Shifter keeps the tracking error minimum during reproduction, therefore, the variable range of which must be 180 degrees mechanically or 16.66 ms (CCIR: 20.0 ms) electrically. Because of the above reason, the trigger signal of the Playback Shifter is set for 60 cps (CCIR: 50 cps) and the variable range has to be 0 to 16.66 ms (CCIR: 20.0 ms). Two sets of the Monostable Multivibrators are connected in series to provide a total variable range of 2 to 18 ms (CCIR: 3.5 to 24 ms) which satisfies the minimum variable range of 16.66 ms (CCIR: 20.0 ms). In order to obtain the above characteristics, in a first Monostable Multivibrator, the triggering of the collector is made by negative pulses and the triggering of the base is made by positive pulses (as the phase relationship of positive and negative pulses are 180 degrees apart) thus obtaining operation as if the triggering were made by a control signal of 60 cps (CCIR: 50 cps).

BUFFER OSCILLATOR:

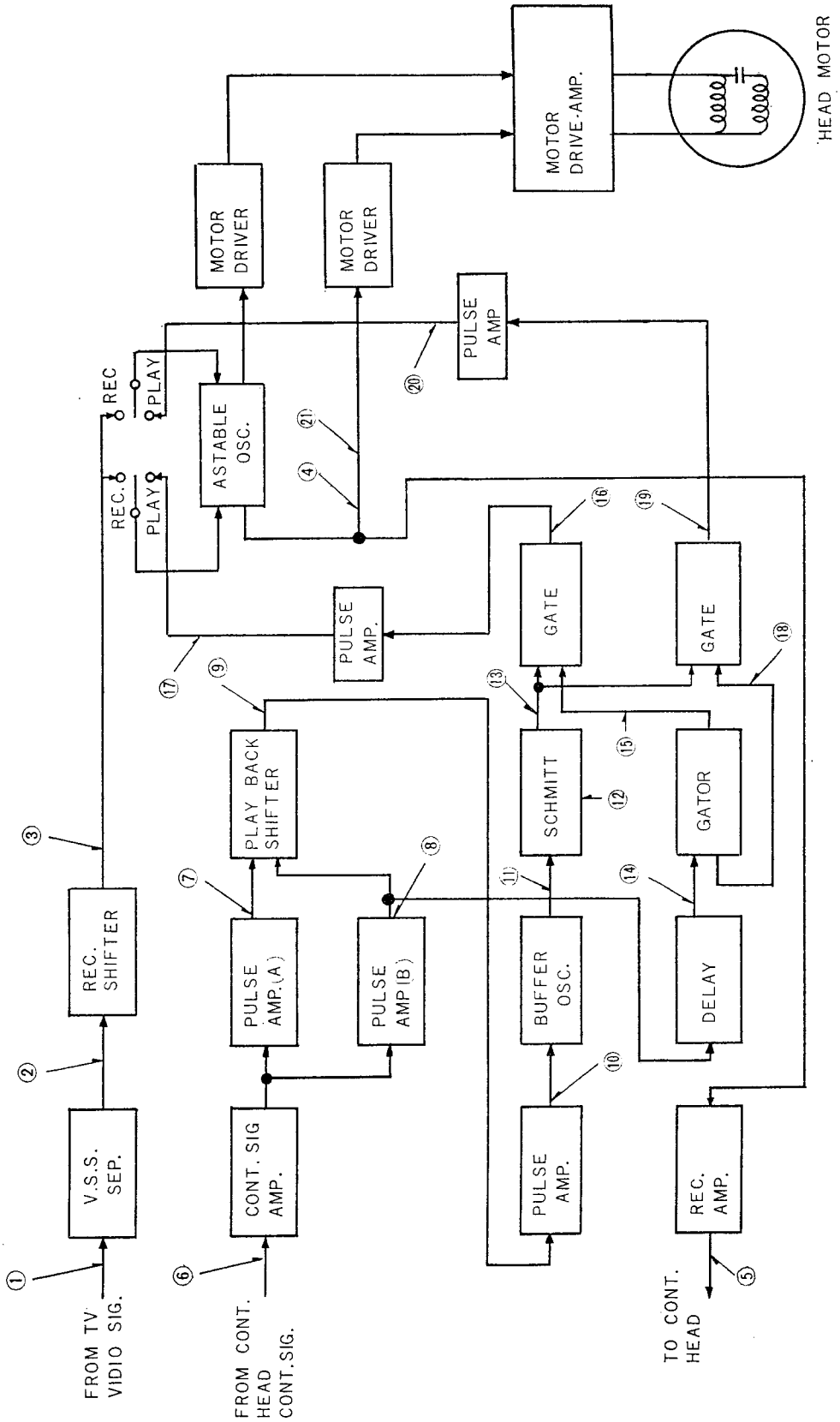
The control and audio signals reproduced from the tape generally changes acsording to the wow and flutter of the mechanism and it is quite difficult to completely eliminate wow and flutter mechanically. To decrease these mechanical variance electrically, a Buffer Oscillator is adopted to dampen these variances. It is required in the Buffer Oscillator that; the "Q" of the Oscillator must be sufficiently high and the oscillating frequency must be stable against the change of outer conditions.

DELAY AND GATE CIRCUIT:

If the triggering of the Astable Multivibrator is made with the output pulse from the Schmitt Circuit, it operates the same as in the case of recording. However, it is impossible to sense both video heads perfectly. When head-B is tracing the locus on the tape recorded with head-A, mechanically, these two heads must be in perfect matching therefore, in order to trace the locus of a head with the same head during reproduction, the Delay, and Gate circuit become necessary.

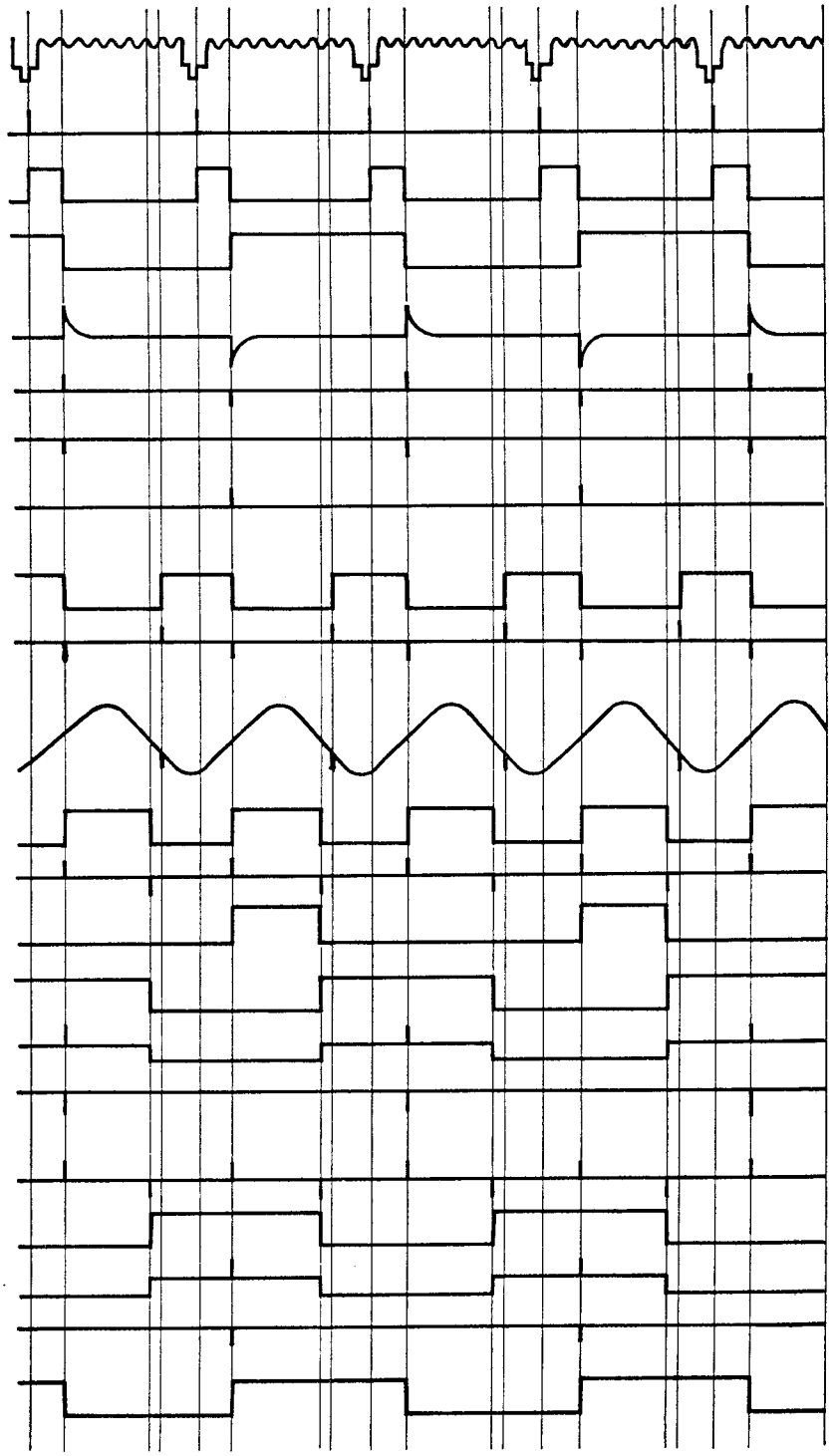
The head sensing is done by triggering the collectors of the Astable Multivibrator after gating the positive pulse of the 3rd Stage of the Cont. Sig. Amp. as well as the output pulse of the Schmitt Circuit by means of two sets of the Gage Circuits. The Gator determines the timing of the gating and it is set for 16.66 ms (CCIR: 20.0 ms). Also, because of triggering the Twin-Tee Oscillator, the control pulse and the output wave forms from the Schmitt Circuit have phase differences of approximately 8 ms (CCIR: 10 ms), so that the pulse which determines the gating time, or in other words, the positive pulse of the 3rd Stage of the Cont. Sig. Amp. must also have same phase difference (8 ms.).

After passing through the above circuits, the Playback Shifter adjusts the position of the heads to the locus exactly as recorded on the tape.



BLOCK DIAGRAM-CONTROL CIRCUIT

1. Video Signal
2. Vert. Sync. Signal
3. Rec. Shifter
4. Astable at Recording
5. Rec. Amp.
6. CONT. Head Output
7. Pulse Amp. A
8. Pulse Amp. B Output
9. Play Shifter
10. Twin-Tee Osc. Trigger Pulse Amp.
11. Twin-Tee Osc. (Buffer Osc.)
12. Schmitt
13. Differenciated Wave-form of (12)
14. Delay by (8)
15. Gator-1
16. Gated (13) (15)
17. Amplified (16)
13. Differenciated Wave-form of (12)
18. Gator-2
19. Gated (13) (18)
20. Amplified (19)
21. Play Motor Drive

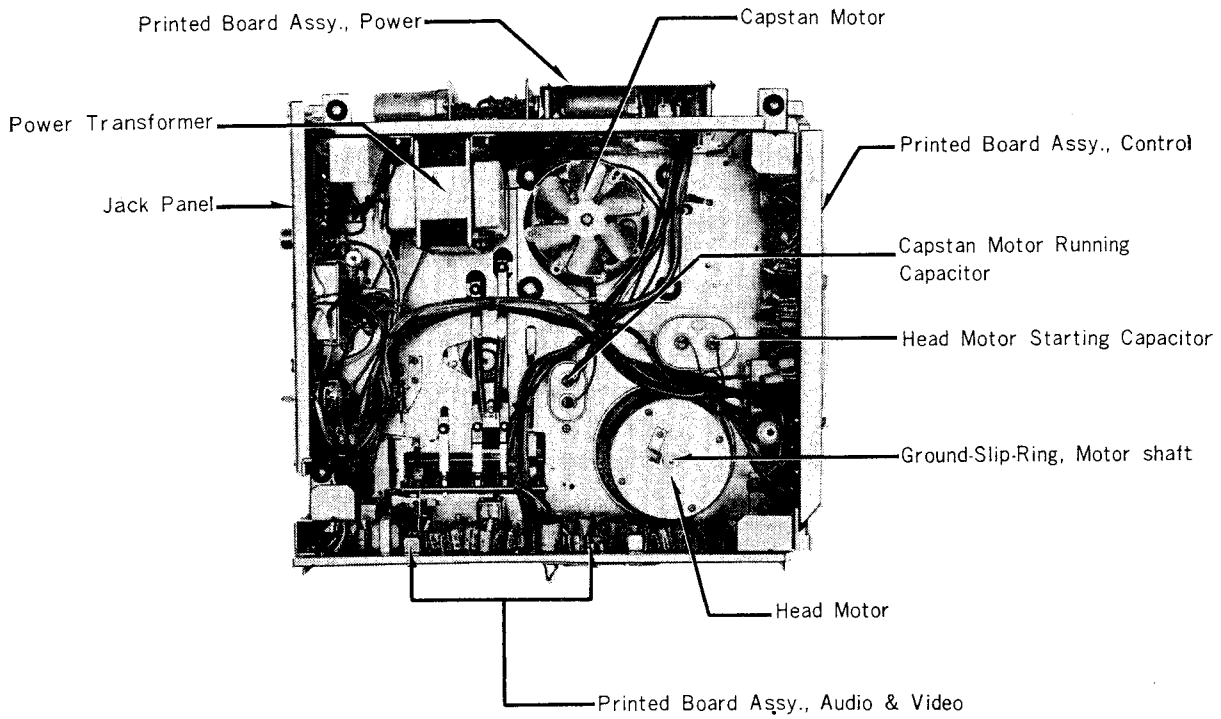


(10 ms/cm)
(CCIR : 8.7 ms/cm)

NOTE: Each of the heading number is reffered to the block diagram of the Control Circuit on Page 24.

MAIN PARTS LOCATION

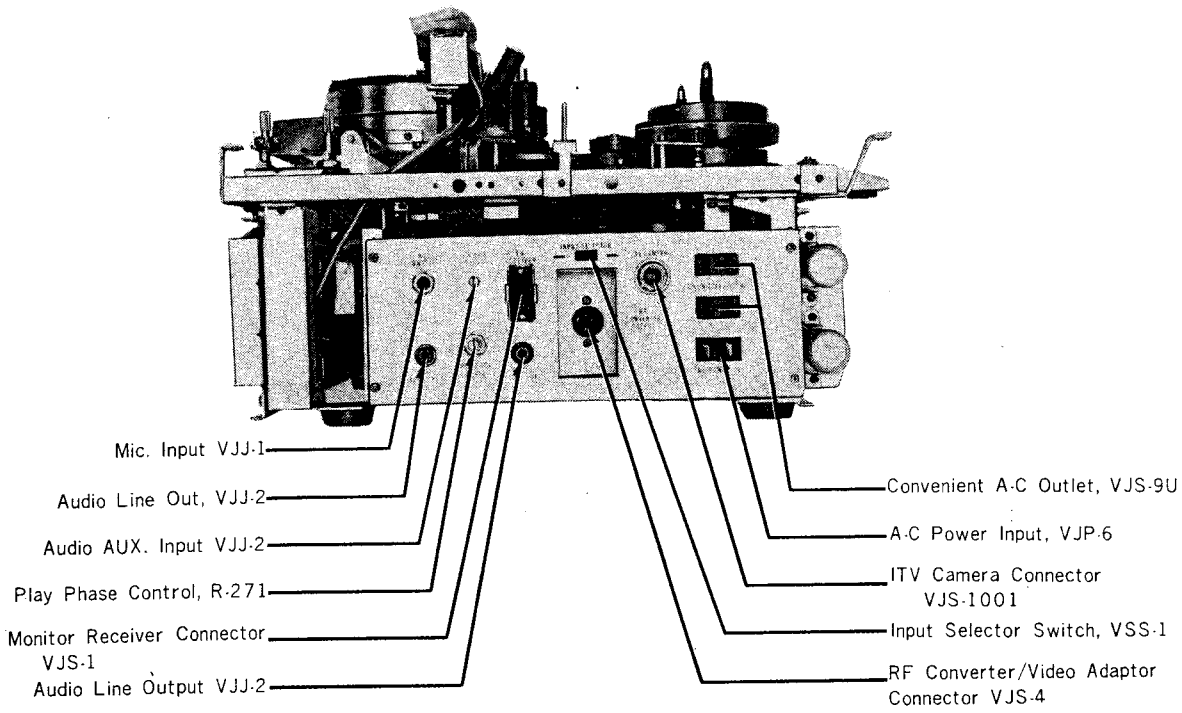
MODEL: NV-1020N, NV-1020E



NOTE: See Page 53, Fig. 58 for the editing model NV-1020D/ED.

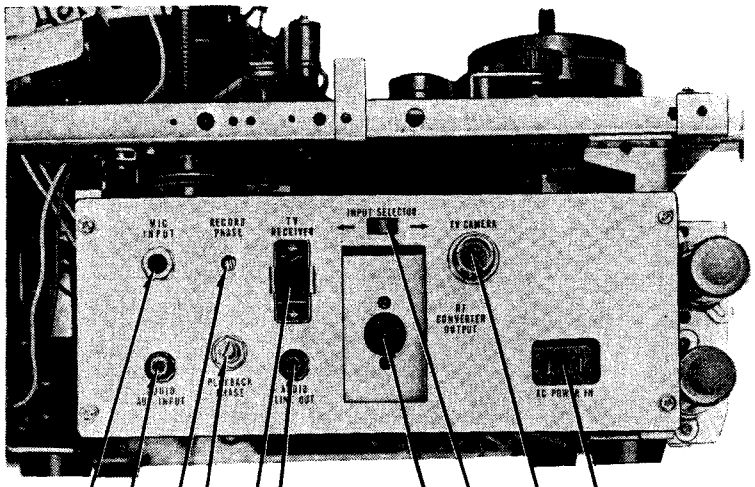
JACK PANEL

MODEL: NV-1020N/D


Mic. Input VJJ-1
Audio Line Out, VJJ-2
Audio AUX. Input VJJ-2
Play Phase Control, R-271
Monitor Receiver Connector VJS-1
Audio Line Output VJJ-2
Convenient A-C Outlet, VJS-9U
A-C Power Input, VJP-6
ITV Camera Connector VJS-1001
Input Selector Switch, VSS-1
RF Converter/Video Adaptor Connector VJS-4

JACK PANEL

MODEL: NV-1020E/ED



Mic. Input VJJ-1

Audio AUX. Input VJJ-2

Record Phase Control, R-220

Play Phase Control, R-271

Monitor Receiver Connector VJS-1

Audio Line Output VJJ-2

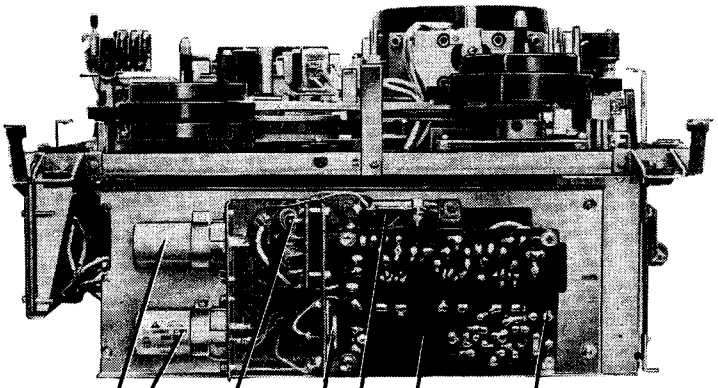
A.C Power Input VJP-4

ITV Camera Connector VJS-1001

Input Selector Switch VSS-1

RF Converter/Video Adaptor Connector VJS-4

POWER SUPPLY CIRCUIT



Filter Capacitor
C-104, C-105

Rectifier, D-101～4

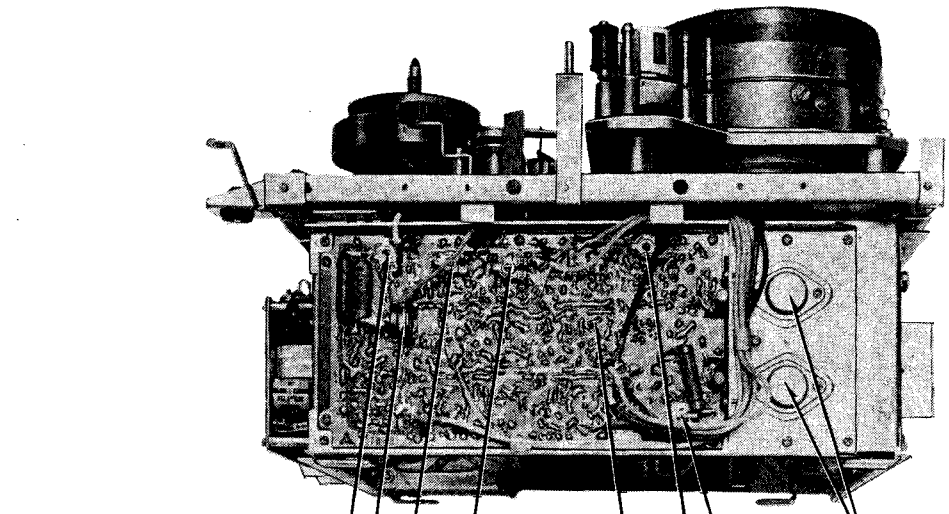
Voltage Regulator, R-108

Printed Board Assy., Power

Filter Resistor, R-101

Voltage Stabilizer Transistor,
Q-101

CONTROL CIRCUIT



Phase Control, R-298

Buffer Osciillator Frequency (60 cps, CCIR: 50cps) Regulator, R-292

Time Delay Regulator, R-2112

Gator Timing Regulator, R-2120

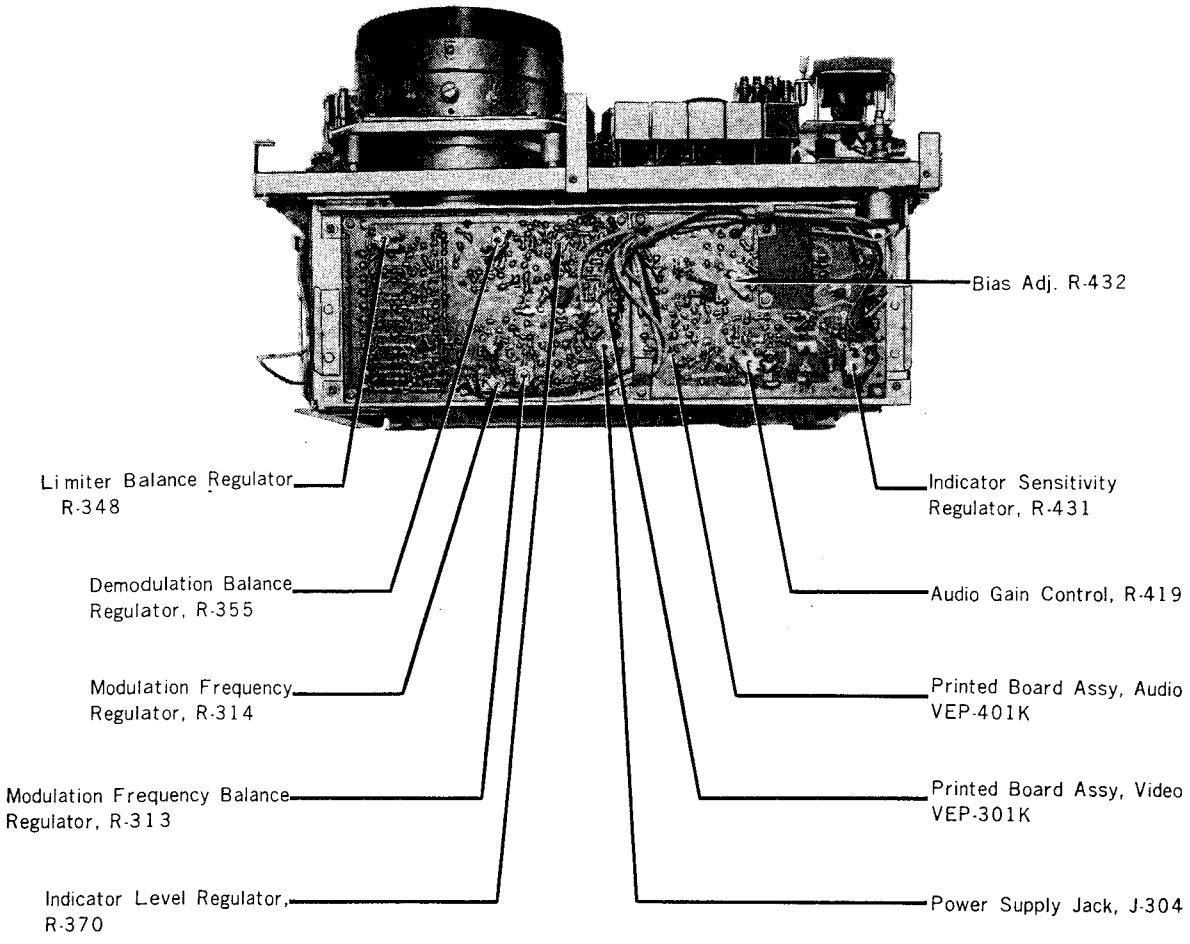
Motor Driving Amplifier Transistor, Q-213, Q-214

Power Supply Jack, J-201

Multiple Virator Frequency (30cps, CCIR: 25cps) Regulator, R-227

Printed Board Assy, Control

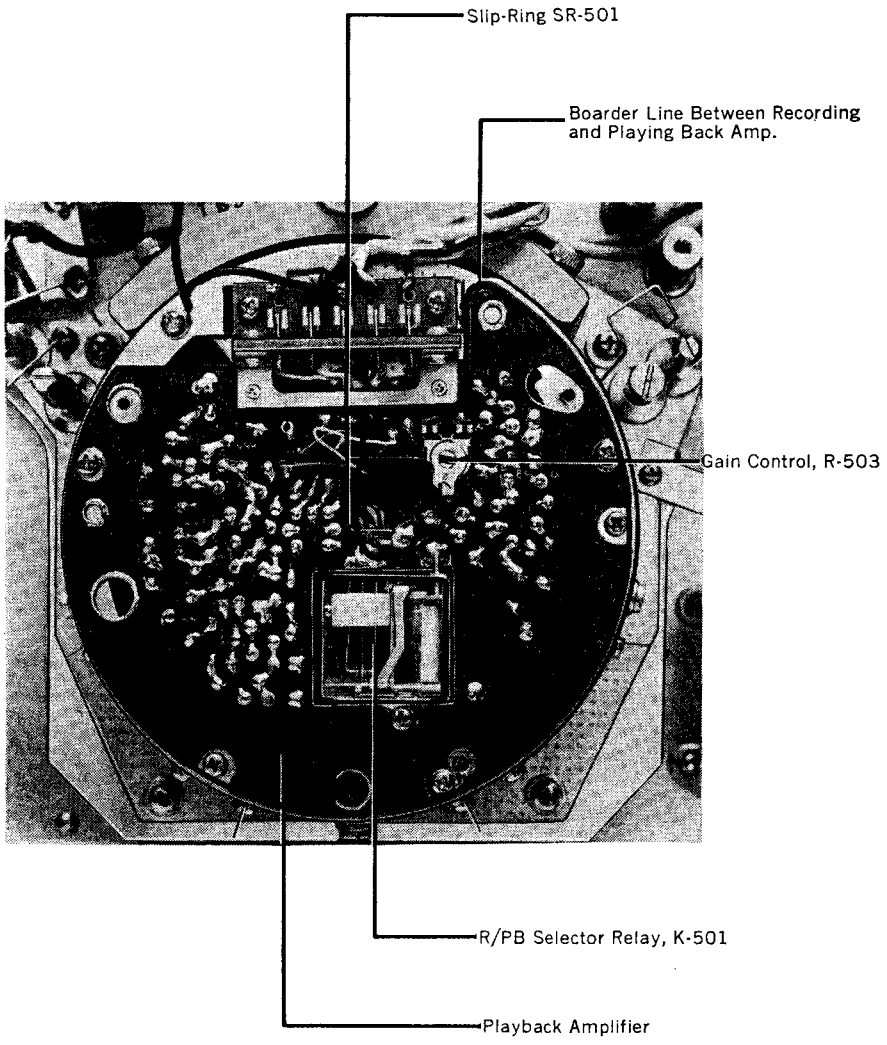
VIDEO AND AUDIO CIRCUITS


Bias Adj. R-432
Limiter Balance Regulator R-348
Demodulation Balance Regulator, R-355
Modulation Frequency Regulator, R-314
Modulation Frequency Balance Regulator, R-313
Indicator Level Regulator, R-370
Indicator Sensitivity Regulator, R-431
Audio Gain Control, R-419
Printed Board Assy, Audio VEP-401K
Printed Board Assy, Video VEP-301K
Power Supply Jack, J-304

RECORD AND PLAYBACK AMPLIFIER

MODEL:NV-1020N/D, NV-1020E/ED

R/PB Printed Board Assy.



ELECTRICAL CIRCUIT ADJUSTMENTS

When service is performed on the printed circuit board or a component part is replaced, conduct the following adjustments:

POWER SUPPLY CIRCUIT

ADJUSTMENT OF POWER SOURCE VOLTAGE

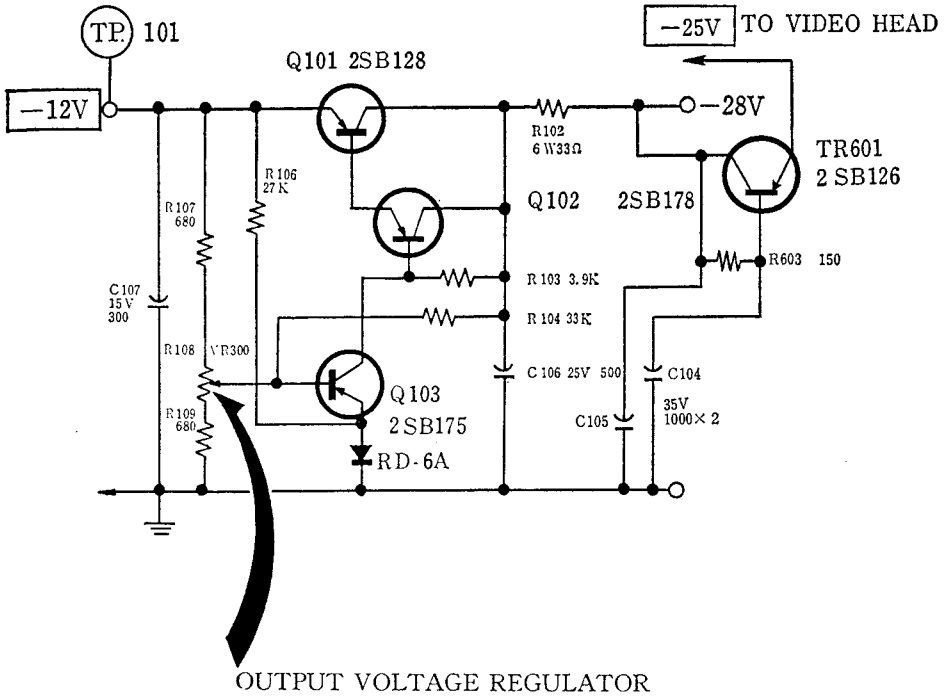


Fig. 27

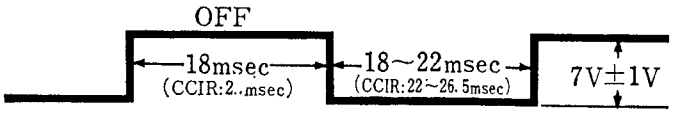
1. Connect the A-C Power Cord, turn the power switch "on" and set the recorder for either Record or Playback mode.
2. After connecting VTVM to the −12 V output terminal (TP101), adjust the output voltage regulator (R108, VR 300 Ω) to obtain −12 V.

CONTROL CIRCUIT

WHEN RECORDING:

1. Adjustments of the Astable Multivibrator and the Motor Driver Amplifier:

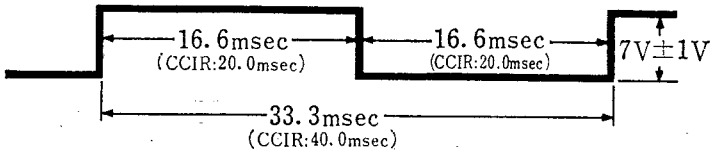
A. Connect an oscilloscope to TP202 (collector of Q-206) and after setting the Astable Multivibrator in free running condition (set the recorder in Record mode and remove the video signal input), adjust R227 (VR 10 KΩ) to obtain the OFF period of 18 msec and ON period of 18 msec to 22 msec (CCIR: 22—26 msec) as shown in Fig. 28.



Wave-form at TP202

Fig. 28

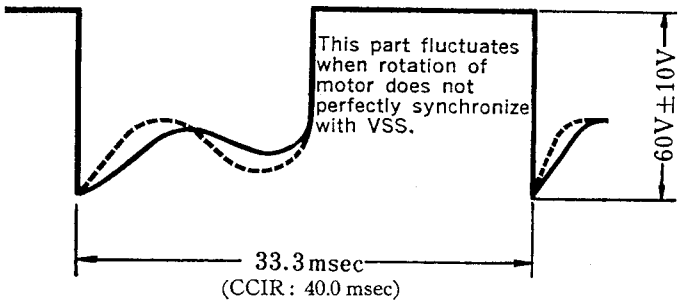
B. After the adjustment item A is completed, connect the video signal to VTR and confirm the wave-form at TP202 as shown in Fig. 29.



Wave-form at TP202 when video signal is fed to VTR.

Fig. 29

C. After confirming that the motor is running in synchronous to the Astable Multivibrator at either the Collector at Q213 or Q214, connect the video signal and confirm that the motor, now, is rotating in synchronous to the Vertical Sync. Signal (VSS) of the video signal. The determination whether the motor is rotating in synchronous to the VSS can be made by observing the waveforms as below.



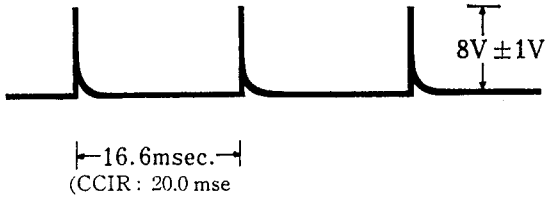
Wave-form of Collector of Q213 or Q214

Fig. 30

D. Confirm that the voltage is −25 V at 3rd pin of the connector (P 102).

2. Adjustments of the V.S.S. Sep. and the Rec. Phase Control:

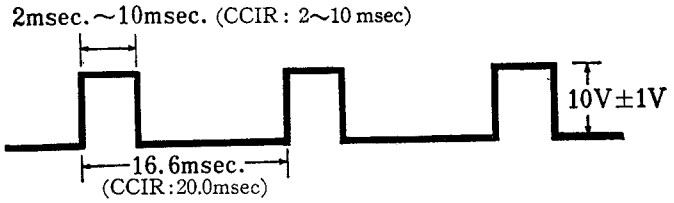
A. The adjustment of the V.S.S. Sep. is unnecessary when video signal more than 0.3 Vp-p (minimum required video signal), is obtainable at the base of Q201. In this instance, the postiive pulse will appear at the Collector of the Q203 as shown in Fig. 31.



Wave-form of Collector of Q-203

Fig. 31

B. The adjustment of the Rec. Phase can be made by connecting an oscilloscope to TP201 (collector of Q205) and by setting R220 (VR 50 KΩ) to obtain the wave-form as shown in Fig. 32. The head switching line position must be set at 3 to 5H above the vertical blanking portion of the television signal while alternately recording and playing back. The final adjustment, however, must be conducted after the adjustment of the playback circuit is completed.

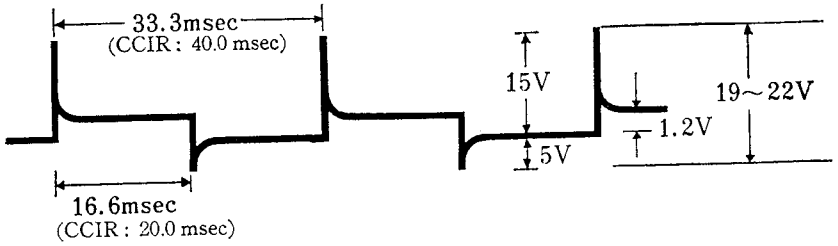


Wave-form at TP201

Fig. 32

3. Confirmation of Cont. Sig. Rec. Amp.:

Connect the oscilloscope to the terminals of control head and confirm the wave-form as shown in Fig. 33.



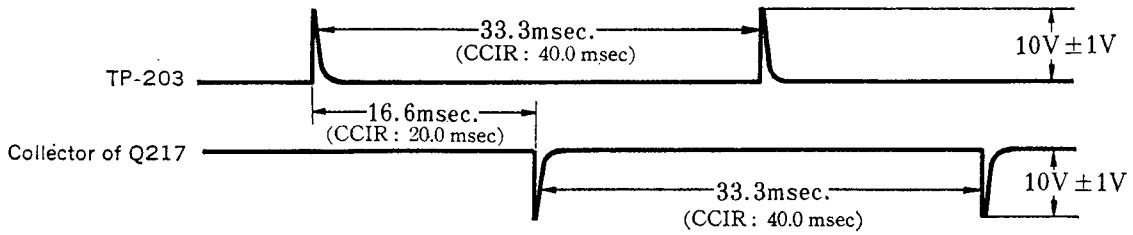
Wave-form at control head terminals

Fig. 33

WHEN PLAYING BACK

1. Adjustment of Cont. Sig. Amp.:

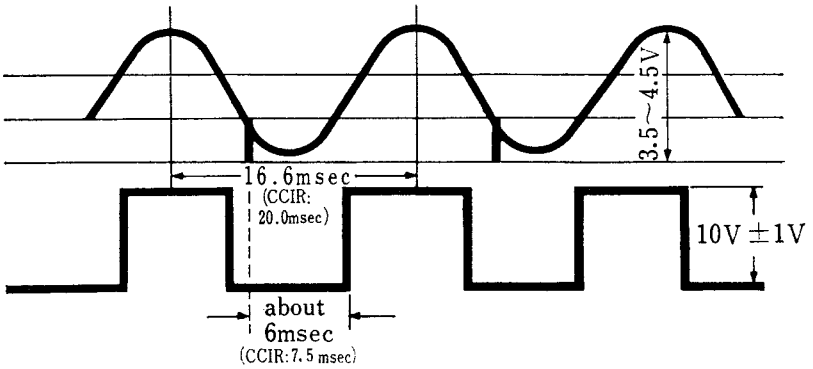
First record the control signal pulses on a tape. When playing back the tape, confirm the wave-form at TP203 (collector of Q218) and the collector of Q217 as shown in Fig. 34.



Wave-form at TP203 and collector of Q217

Fig. 34

To determine the wave-form of TP204 in relation to the signals of Q217 collector and TP203, observe TP203 first and then the collector of Q217 with the wave of TP204 on the Dual-Beam oscilloscope adjusting R271 for correct relations as shown in Fig. 35. (Check in combination ② and ③ first, and then ① and ③ in Fig. 36)



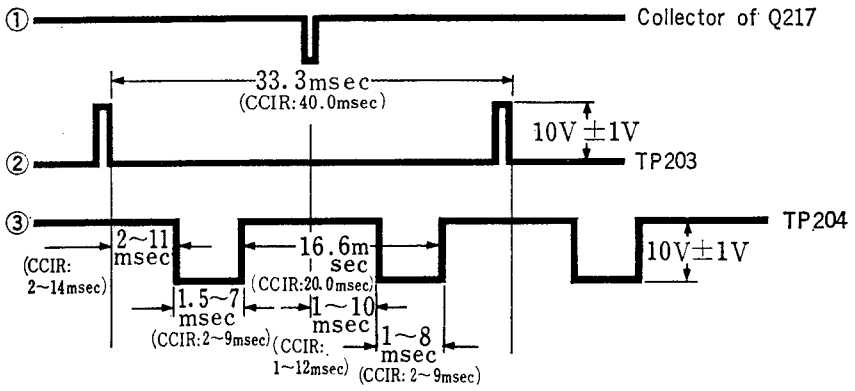
Wave-forms for Playback Phase Adjustment

Fig. 35

2. Adjustment of Buffer Oscillator:

A. Connect an oscilloscope to TP205 (Q225) with the recorder in record mode and set the time base to 5 msec. with Triggering Mode to Line (60 Hz) 50 Hz. Then, adjust R292 (VR 2KΩ) so that the wave-form as written per the Line Sync. is stabilized with the oscillated sine wave-form obtained from TP205 when it comes to 60 (CCIR: 50 cps.) Hz.

B. Confirm that the played back signal appears at the place as shown in Fig. 35 when the tape is played back and there must be an approximately 6 msec (CCIR: 7.5 msec) phase difference between the pulses at TP205 and TP206.



Wave-form at Buffer Oscillator

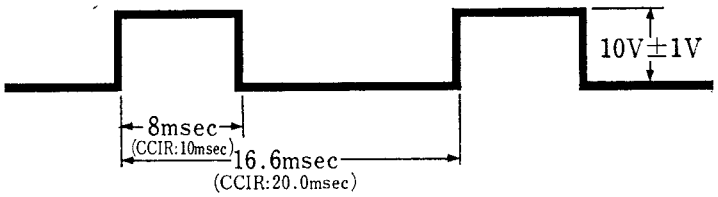
Fig. 36

C. However, this phase difference must come to 8 msec. (CCIR: 10 msec) by adding it with the minimum shifting volume [approximately 2 msec. (CCIR: 3.5 msec.)] of the playback phase control. If the 8 msec. (CCIR: 10 msec. (combination of the phase diffe-rences of the playback phase control, Buffer oscillator and the Schmitt circuit) is unobtainable, re-adjust R298.

3. Adjustment of the Delay and the Gater Circuits:

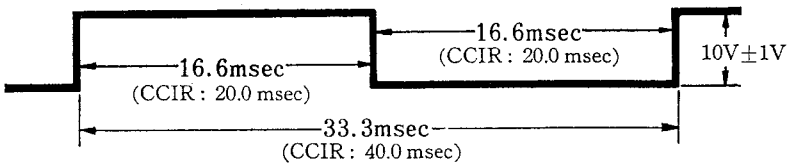
A. After connecting an oscilloscope to TP207, adjust the R2112 (VR 100 KΩ) to obtain a Delay time of 8 msec. (CCIR: 10 msec)

B. After connecting an oscilloscope to TP208, adjust the R2120 (VR 100 KΩ) to obtain a Gater Delay time of 16.6 msec (CCIR: 20.0 msec) with duty cycle of approx. 50:50.



Delay time adjustment

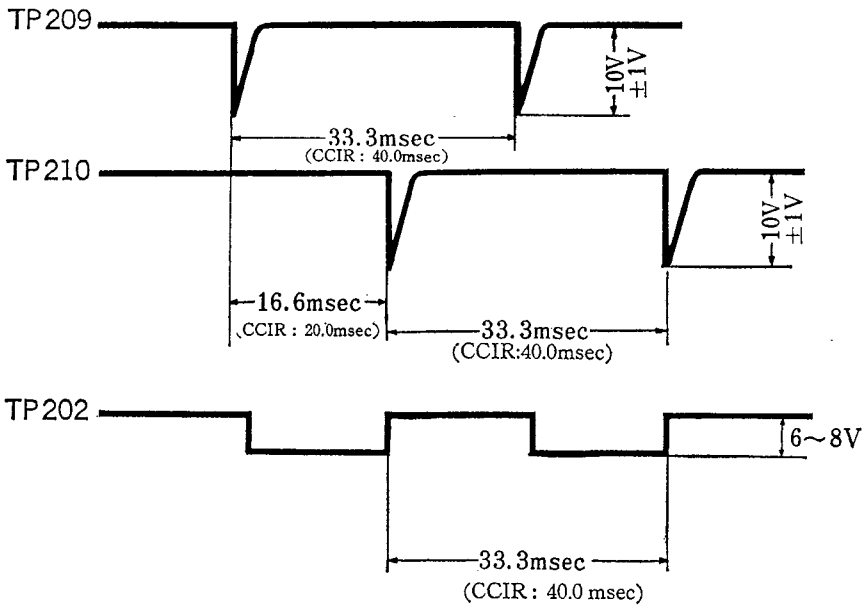
Fig. 37



Gater delay time adjustment

Fig. 38

C. After the above adjustments are completed, connect a Dual-Trace Oscilloscope to TP210 and TP–209 and confirm that the wave-forms on the screen must have the phase relationship as shown in Fig. 39 [having phase difference of 16.6 msec. (CCIR: 20.0 msec) each other], and further when comparing the wave-forms between either one of TP209 or TP210 and the TP202, the timing of the delay must coincide as shown in Fig. 39. Also confirm that this relationship must not be affected even when the R271 (playback phase control) is rotated. Otherwise, repeat the above adjustments.
Also in order to observe the relationship with the S/N ratio of the video signal in playback mode, confirm that the timing of the waveforms at TP203 and TP209 must coincide when observed with a Double-Beam Oscilloscope to obtain the best S/N ratio and the variable range of wave-form of TP209 must be ±6 to 7 msec. against the wave-form of TP203 when the playback phase control is adjusted.



Wave-form relationship at Control Circuits

Fig. 39

VIDEO CIRCUIT ADJUSTMENT

LIMITER BALANCE: R354

1. Connect the SG to TP–501 through a 100 ohm resistor as Fig. 40.

DEMODULATOR BALANCE: R365

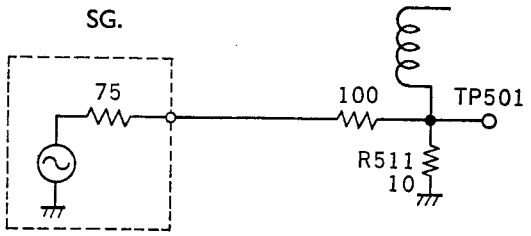


Fig. 40

2. Connect the oscilloscope to TP307.
3. Adjust the SG output frequency for 2.5 MHz and also adjust the output level for approximately 3 mVp-p at R511 resistor.
4. Turn on the VTR (Do not push the REC button)
5. Turn the Video Level Control R372 and set it around the central position.
6. While observing the oscilloscope waveform adjust the R354 (LIMITER BALANCE) and R365 (DEMOD. BALANCE) alternately to minimise the 2.5 MHz signal of which the waveform is described in Fig. 41–b below.
   CAUTION: The SG output level of the secondary RF should be less than −40 dB.

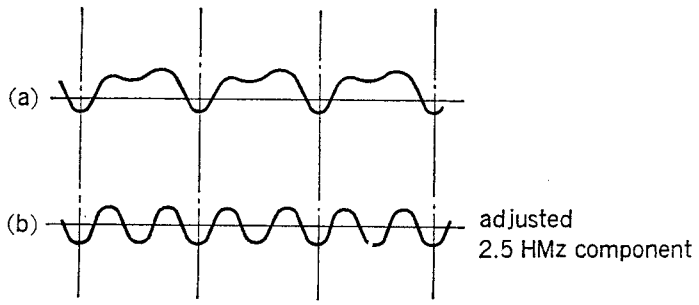


Fig. 41

MODULATOR CARRIER FREQUENCY: R331

1. Connect the frequency counter at TP304.
2. Turn the capacitor C324 and set it at the center position as described in Fig. 42.
3. Place the deck in the E-E mode and set the Video Level Control at its minimum position.
4. Preset the resistor R335 (White Clip) at the extreme CW position.
5. Adjust the resistor R331 for 2.6 MHz oscillation. (Freq. Adjuster)

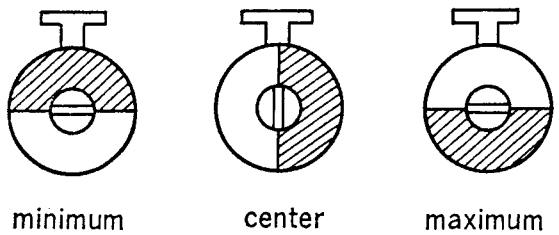


Fig. 42 Position of C324

MODULATOR BALANCE: R343 and C324

1. Connect the oscilloscope at TP307.
2. Place the Deck in the REC mode.
3. While observing the waveform on the oscilloscope output waveform of 2.6 MHz signal should be adjusted for the minimum by turning the R343 and C324.
4. When C324 is turned, follow the instructions made in the MODULATOR CARRIER FREQUENCY as the oscillation frequency changes.

DEVIATION: R303

1. Connect the calibrated SG at TP305.
2. Connect the stairstep wave at the camera input terminal of the deck.
3. Connect the oscilloscope to TP307.
4. Set the frequency oscillation of the SG at 4.5 MHz with the output level of approx. 10 mVp-p.
5. Place the deck in E-E mode and adjust R303 for zero beat of white level at the top step of the stairstep waveform as described in Fig. 43 when the deviation reaches at the 5.4 MHz modulation of the frequency. This condition is principally called "STANDARD MODULATION LEVEL".

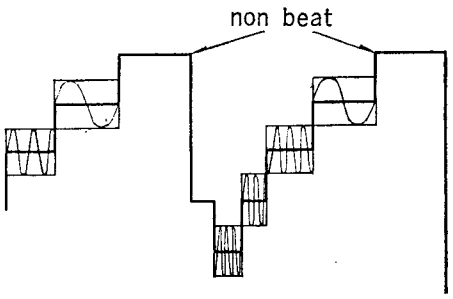


Fig. 43

VIDEO OUTPUT LEVEL: R372

1. Connect the minitor TV receiver to the terminal J302.
2. While observing the TP307 with the oscilloscope, the output level of the stairstep waveform modulated by the standard modulation level should be adjusted for 1 Vp-p.

INDICATOR LEVEL: R384

1. Connect the TV receiver to the J302 and place the deck in the E-E mode.
2. Confirm the standard modulation level and 1 Vp-p output level of stairstep waveform at TP307.
3. Adjust R348 (Indicator level) for the level with which the E-E picture proves to be the maximum modulation.

WHITE CLIP LEVEL:

1. Feed the Test Pattern signal from the camera input terminal.
2. Connect the oscilloscope at TP303.
3. When the Test Patrern signal is modulated in the standard modulation level, adjust R335 (white clip) for the level just before which the preemphasised signal of high frequency portion is clipped.

AUTO LEVEL: R316

1. Connect the stairstep wave signal to the camera input terminal of the deck.
2. Connect the oscilloscope to TP307.
3. Place the deck in E-E mode and the output level modulated by the standard modulation level should be confirmed for 1 Vp-p.
4. Set the Video Level Control to AUTO-LEVEL by turning the control clockwise until the click is heard.
5. Set R316 for 1 Vp-p by turning it so slowly and gently as the DC current is flown permitting a little time to stabilise the level.

RECORD CURRENT: R503

1. Connect the oscilloscope at TP501 and place the deck in the E-E mode.
2. Set the Video Control level to its minimum position (no modulation).
3. Adjust R503 for 140 mVp-p by observing the oscilloscope waveform.
4. Confirm the total head current of both video heads reaches 14 mAp-p at 2.6 MHz.

AUDIO CIRCUIT ADJUSTMENT

VU METER ADJUSTMENT:

1. Connect the standard signal generator to the Microphone input (J401) or AUDIO AUX input (J402) and set SSG for 1 KHz.
2. Connect a VTVM to TP401, and turn the power switch on, and depress the REC button while setting the video control for manual operation.
3. Adjust the output gain control of the SSG with input volume control of the unit (R403) set at maximum to obtain output voltage of 2 Vrms at TP401.
4. With the above setting. adjust R437 to obtain 0 VU reading on the VU meter.

ADJUSTMENT OF THE WAVEFORMS FOR BIAS AND ERASURE OSCILLATOR:

1. Set the recorder in the record mode.
2. Connect an oscilloscope to TP402 and set the audio level R403 at the minimum position.
   Confirm that the output waveform on the oscilloscope appears as sine wave symmetry without much distortion as shown in the Fig. 44.

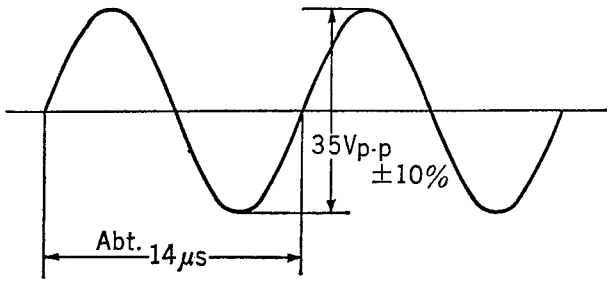


Fig. 44

ADJUSTMENT OF TRAP CIRCUIT FOR BIAS SIGNAL:

1. Depress the REC button and set the R403 at the minimum position.
2. The frequency of about 70 KHz. leaking from the oscillator for recording and erasing bias, is to appear on the oscilloscope if it is connected to TP401.

3. Adjust the variable inductance L401 and L402 in the attenuating trap circuit for 70 KHz and obtain minimum waveform of output level on the oscilloscope.

ADJUSTMENT OF AUDIO RECORDING BIAS CURRENT:

1. Insert a 100Ω resistor between the H2 terminal on the printed circuit board and the audio record head, and connect a high-sensitivity VTVM capable of reading 1 mV across the resistor as shown in Fig. 45.

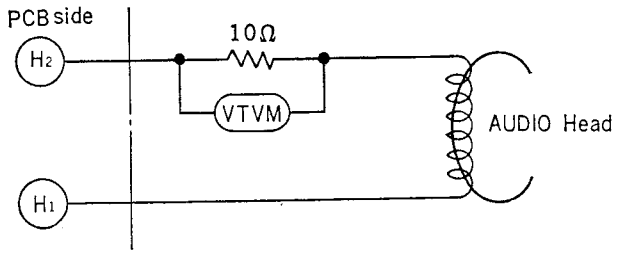


Fig. 45

2. Depress the Rec button and set R403 at minimum position.
3. Adjust the Bias adjustment control R440 for 2.5 to 3.6 mV rms reading on the VTVM.

ADJUSTMENT OF AUDIO PLAYBACK GAIN CONTROL:

1. Connect standard Signal Generator to the MIC input (J401) and set SSG for 1 KHz.
2. With the audio level control set at maximum, adjust the output level control of the SSG for O-VU on VU meter.
3. Record and playback the tape. Adjust the playback Gain Control Adjustment (R423) control for output voltage of 2 Vrms.

AGC CIRCUIT ADJUSTMENT:

1. Place the recorder in REC mode and settle selector S302 to AGC position.
2. Connect SSG to MIC connector J401 and drive the pulse signais as shown in Fig. 46–1 and 46–2 respectively.
3. Connect the oscilloscope to TP401 and confirm the waveform respectively as shown in Fig. 46–3 and 46–4 with the input signal mentimed above.

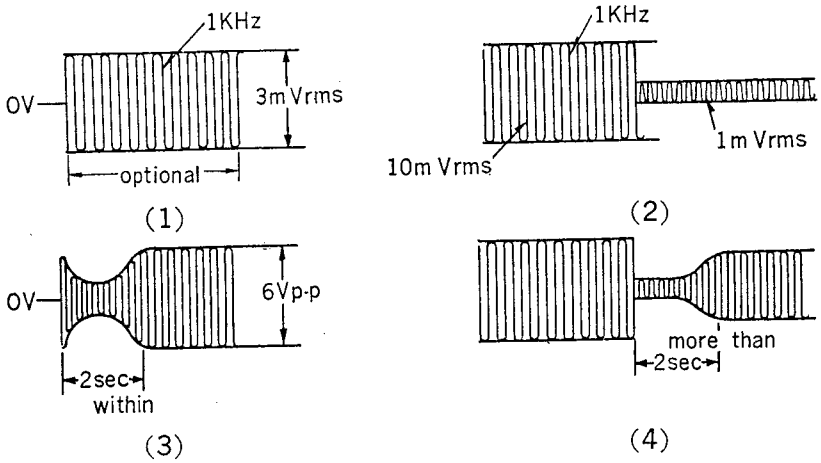


Fig. 46

Confirmation of Audio Dubbing Mode:

1. Turn the power switch ON and record the video and audio Signals on the tape, and confirm that the playback works properly.
2. Set the video level control R302 to the audio dubbing position, and rewind the recorded tape.
3. Connect a microphone to MIC. INPUT, J401 or the other audio source to AUX. INPUT, J402 with TV-Camera switch at camera position and record the audio signal on the tape.
4. Reset the video level control R302 to normal mode and rewind the tape.
5. Confirm that the added audio signal is properly played back.

Audio dubbing may also be made from monitor TV, however, if new audio is from monitor TV, TV-Camera switch should be in TV position.

DESCRIPTION OF THE EDITING FUNCTION (NV-1020D/ED)

It is often desirable or necessary to join together on a single tape several video recordings that have originated from separate cameras. Physical splicing is possible but difficult for helical scan recorders. The skill, equipment and time required for physical splicing make it unattractive for practical use. The NV–1020ED/D editing function is a means of electronic splicing which requires no tools and no special skills. The NV–1020ED/D will piece together any number of video recordings producing a single, continuous tape with no blank frames.

THEORY OF OPERATIONS

Electronic splicing is accomplished in a way which is analogous to the operation of a synchromesh automobile transmission. In this kind of transmission, it is not possible to "grind" the gears in normal gear changing because the synchromesh system insures that the individual gear teeth are in perfect alignment prior to allowing the change to take place. The NV–1020ED/D electronic splicing is achieved in a similar way where the vertical sync pulses in the video recordings are comparable to gear teeth in the transmission. In the editing mode the NV–1020ED/D senses the phase difference between the vertical sync pulses in the two individual video recordings. When there is zero phase differential, the NV–1020ED/D recording function is activated and electronic splicing takes place. Done in this way, there is no interruption in synchronization and the helical scanning mechanism will continue its smooth constant speed operation.

For purposes of this discussion, it is assumed that the individual and separate video recordings have been produced with precisely the same format. It is very important that the time base of the vertical synchronization in the composite video is nearly identical among the various separate recordings. Electronic editing will be depreciated or rendered useless if the time bases are not essentially identical. In practice, it is quite easy to meet these requirements by utilizing the same sync generator to produce each recording. The NV–1020ED/D electronic editing function processes the synchronization derived from composite video and should there be a malfunction in, for example, the sync injection circuit in one camera, the result may appear as poor editing performance. Therefore, the NV–1020ED/D should be considered as a system together with the sync source, the cameras and the tape itself. Perfect editing will depend on correct relationships between the various system components.

WORD PICTURE OF THE PROCESS

Assume that a tape has been recorded but a certain part of the recording needs to be changed. The change will be achieved with a camera supplying composite video to the camera input coaxial connector on the NV–1020ED/D. The following sequence will commence when, at the appropriate time during replay of the tape, the edit button (S106) is depressed. (See Schematic Diagram)

At the instant the edit button is pushed, relay K2201 is energized initiating four subsequent events simultaneously:

[1] Through relay contacts K2201–4, synchronization pulses are removed from the head motor amplifier circuit causing the head motor to change to its free running speed near 30 rps (CCIR: 25 rps).

[2] Through relay contacts K2201–2, a series interlock connection with K2202–2 is established which controls the erase oscillator. E esreasur odntoc ommence until the timing cycle involving K2202 is complete.

[3] Through contacts K2201–1, relay K101 is energized. This relay removes power from the replay head amplifier and also removes clamp power from the phase trigger (Q2203, Q2204). The latter action serves to arm the phase detector preparing it for operation.

[3] Through contacts K2201–1, relay K101 is energized. This relay removes power from the replay head amplifier and also removes clamp power from the phase trigger (Q2203, Q2204). The latter action serves to arm the phase detector preparing it for operation.

[4] Through contacts K2201–3, the timing cycle of K2202 is started. After a short delay of approximately 1/2 second relay K2202 will engage. The delay permist stabilization of the FM modulator. Note that the reaction of K2202 is also delayed at the end of an editing cycle, this delay is about 3 times longer than the first and its purpose is noise elimination. The record mode continues for about 1.3 seconds after the erase oscillator is shut off and 1.2 seconds corresponds to the distance between the erase head and the sync track head at a tape transport velocity of 12 ips (CCIR: 9.8 ips = 24.9 cmps).

Referring to the Block Diagram of Event Sequence (Page 45), note the functions related to the operation of relay K2202.

The erase oscillator series interlock has already been mentioned, accounting for contacts K2202–2.

The record head amplifier power supply is switched through contacts K2202–1. The sync control head is controlled by contact set K2202–4 and the phase detector input by K2202–3.

Notice that the head motor amplifier input is selected through relay contacts K201, 2, 3 and that these contacts engage at some time following operation of K2202. The exact time between operation of K2202 and K201 depends on the direct phase correspondence between the vertical sync being stripped from the com -posite video coming from the camera input and that of the free running buffer oscillator. Switching delay is proportional to the phase differential.

There is only a statistical correspondence between the stripped sync and the sync recorded on the tape at this instant. Before phase detection takes place, the output phase of the free running buffer oscillator is recorded on the sync track. When phase detection has taken place the phase recorden on the sync track is controlled by the output of the sync stripper circuit. Therefore, in the transition period (after K2202 engages and before K201 engages) the record phase may be incorrect and the characteristic switching line may be observed briefly on the monitor during replay of this part of the edited tape. If the switching line appears at all, it should persist only momentarily and should not reappear.

Since there is only a statistical correspondence between phases during the transition period, there will always be a probability of the record phase line appearing in the picture, however, with the recommended adjustments the occurrence will be rare.

PHASE DETECTOR

Q2201 and Q2202 comprise the phase detector. The input to Q2201 comes from the sync stripped (collector terminal of Q205) through relay contacts K2202–3 after a delay of about 1/2 second when the edit button is pushed. Q2202 gets a vertical sync input from the buffer oscillator through the collector terminal of Q233. Coincidence of the two vertical sync pulses causes TP2201 to momentarily attain ground potential.

PHASE TRIGGER

When TP2201 is at ground potential, the phase trigger Q2203 and Q2204 connected as a one-shot multi-vibrator, transmits a pulse to the next stage.

RELAY DRIVER

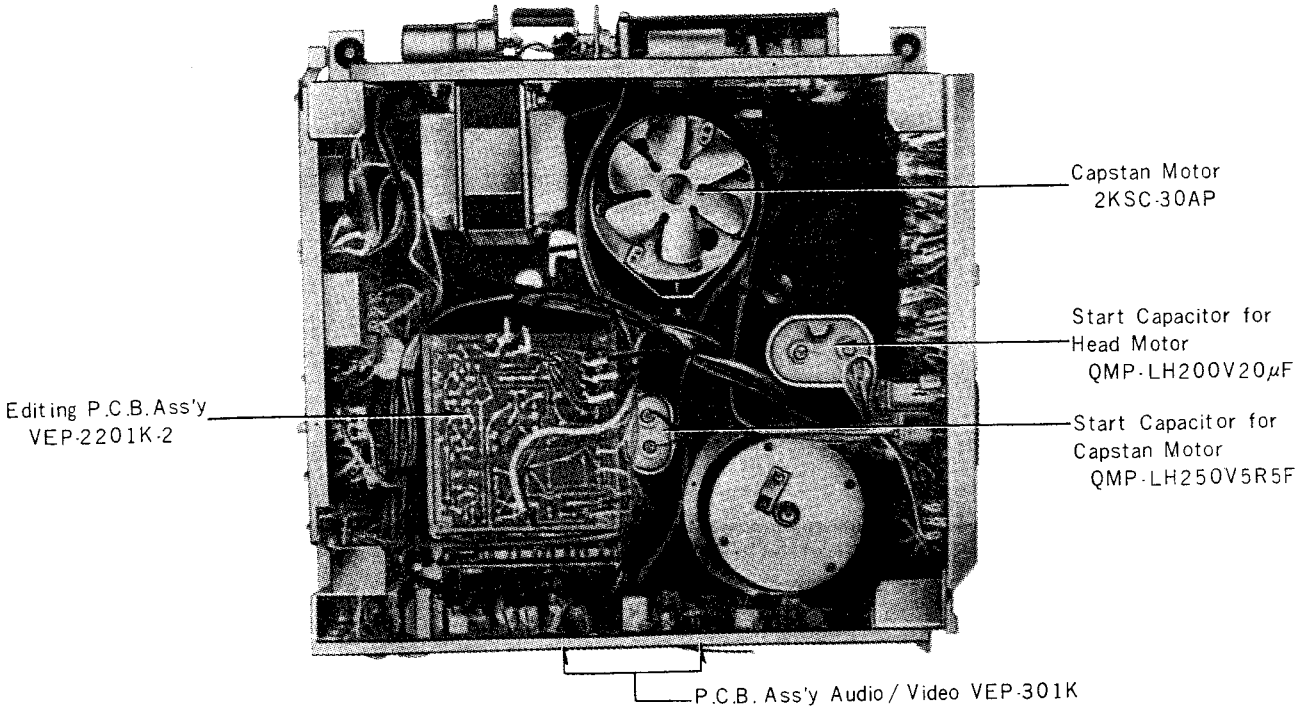
Q2205 and Q2206 make up a darlington amplifier which drives relay K201, the head motor amplifier input control.

TIMER

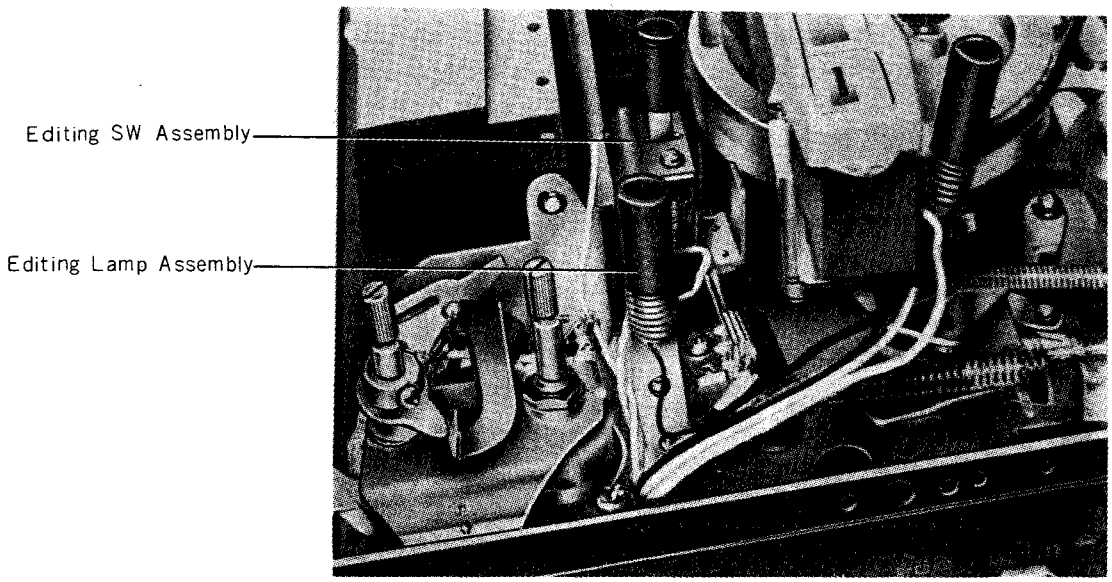
Q2207 and the resistor capacitor networks in its base circuit form a time delay for relay K2202. R2222 is adjusted for a delay of between 0.1 and 0.5 seconds at the beginning of the editing cycle. R2221 is adjusted for a delay of about 1.2 seconds at the end of the editing cycle.

Timing may be measured by connecting a dual trace oscilloscope to the "R. A." and "Edit" terminals of the printed circuit board VJB–203–3.

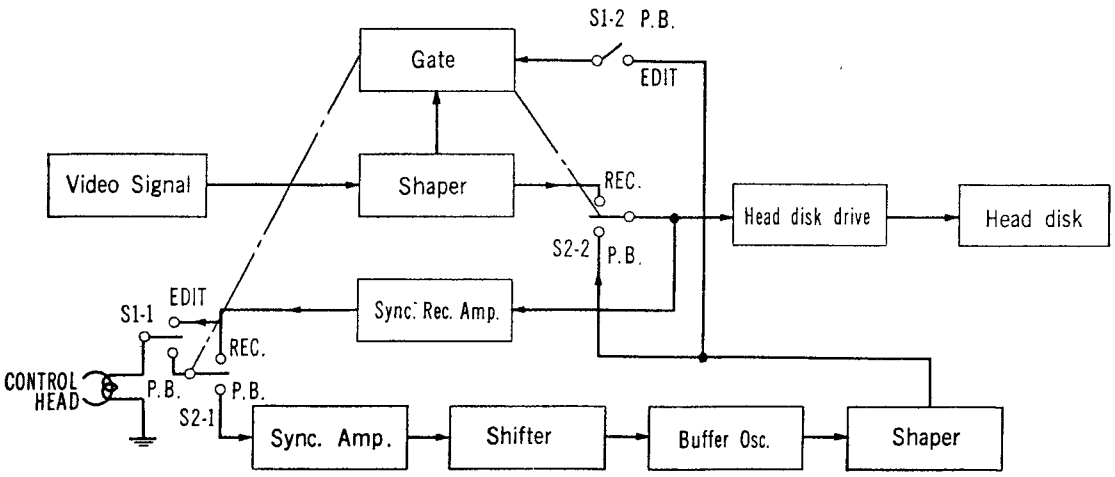
EDITING PARTS LOCATIONS I.



EDITING PARTS LOCATIONS II.

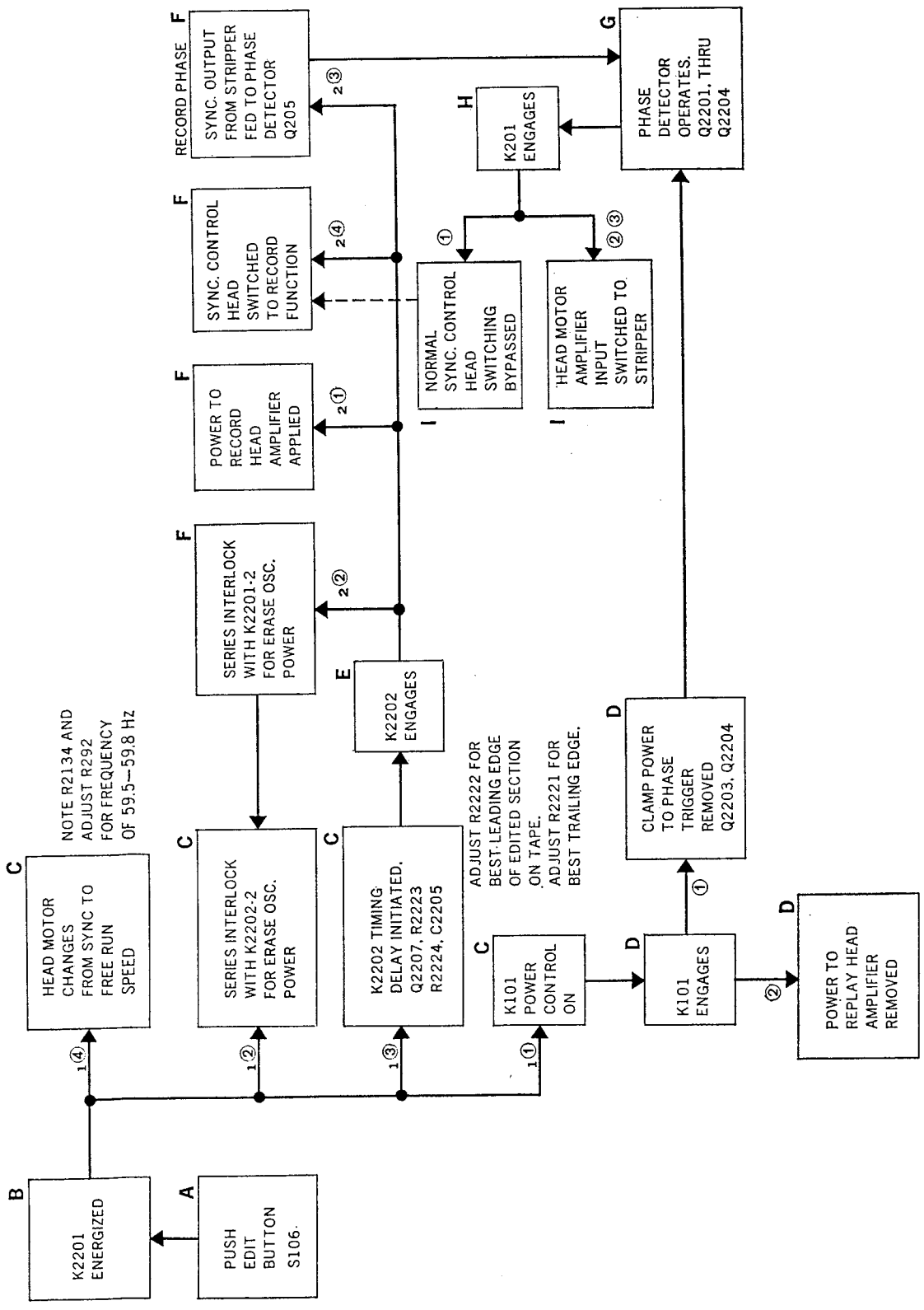


BLOCK DIAGRAM OF EDITING CIRCUIT

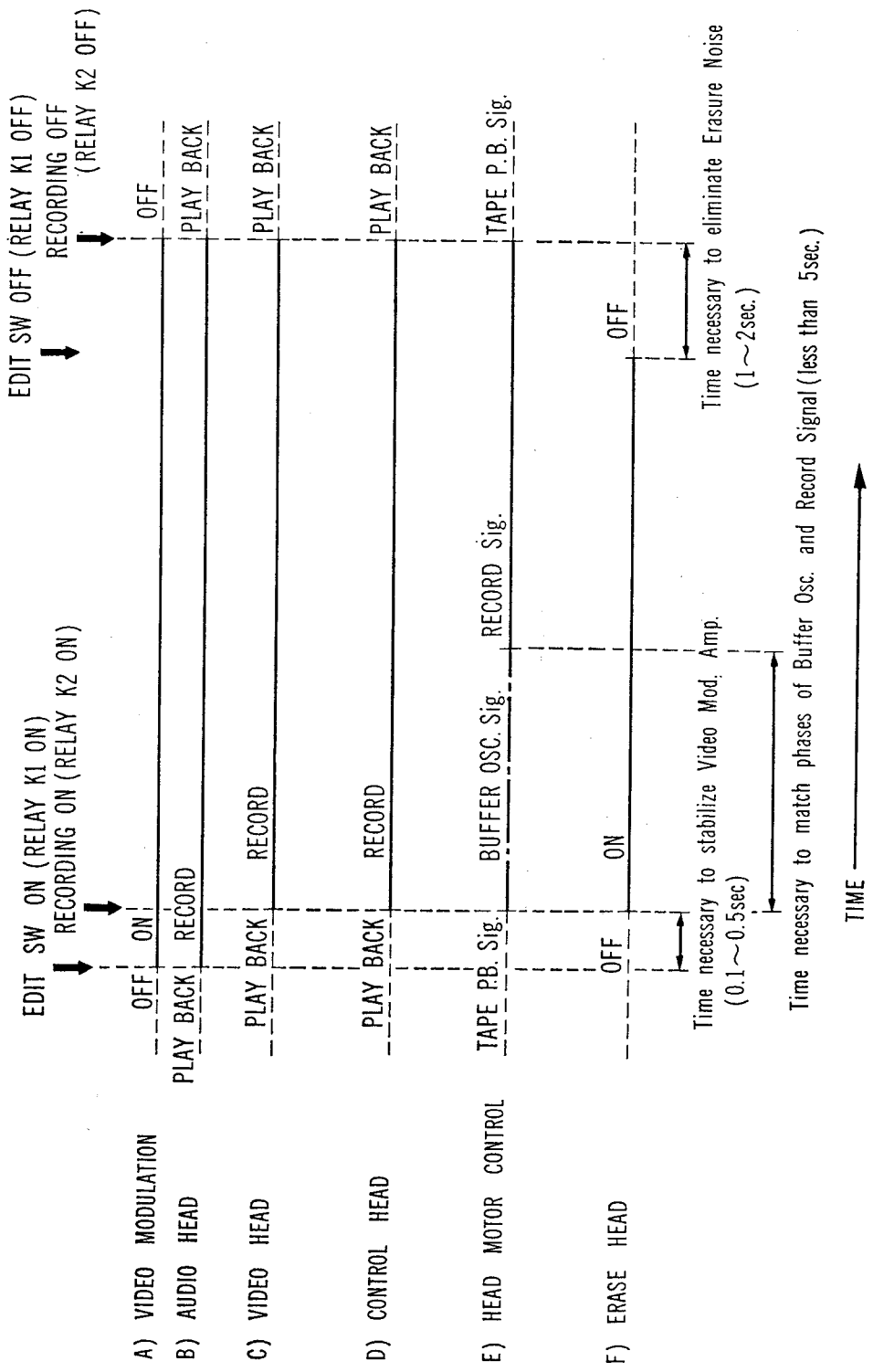


EVENT SEQUENCE FOR EDITING

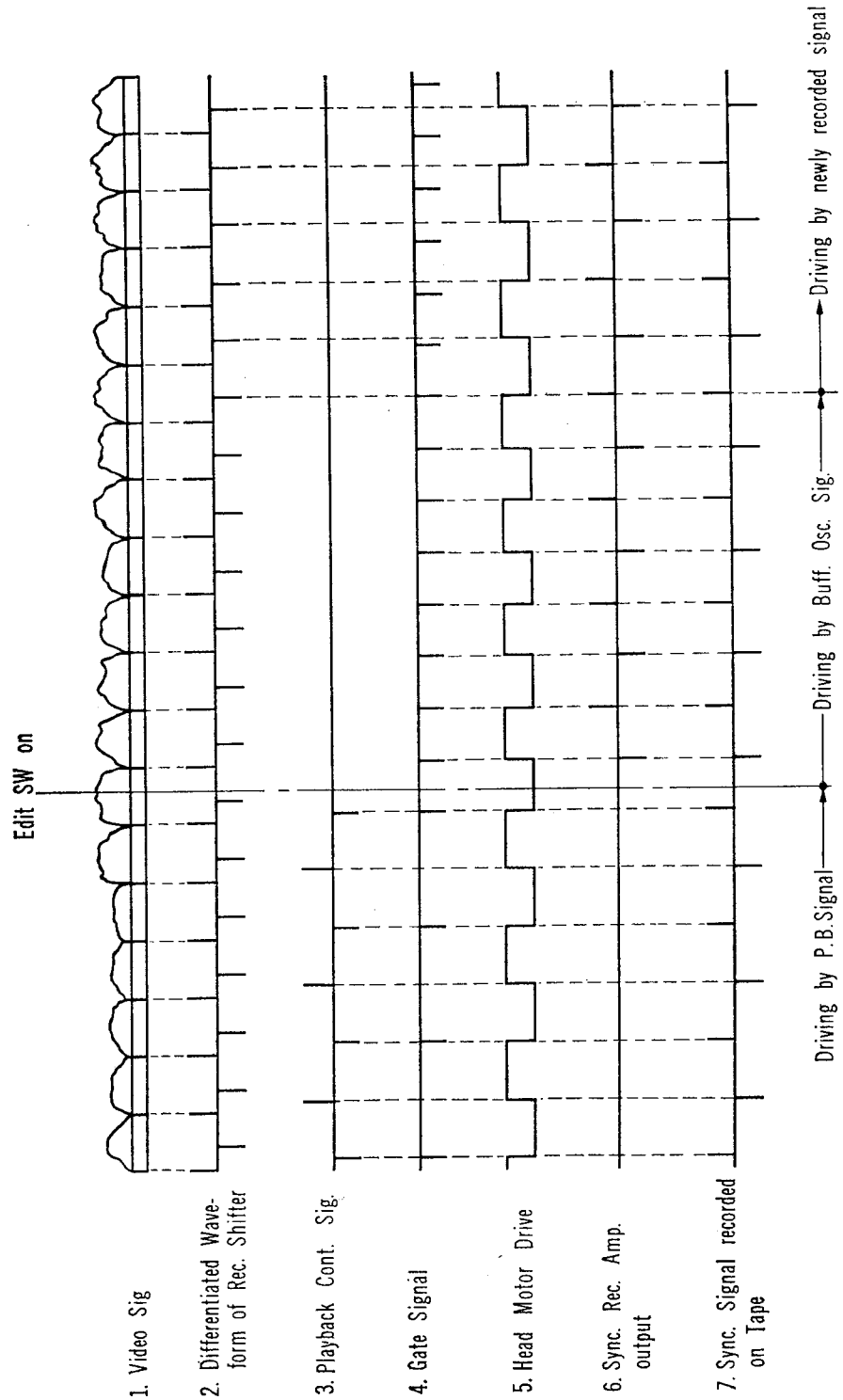
NOTE: LETTERS INDICATE TIME ORDER OF EVENTS BEGINNING WITH LETTER "A" AND ENDING WITH LETTER "I" FOR EDIT START.



RELATIONSHIP OF OPERATIONAL TIMING OF EACH PART WHEN EDITING


EDIT SW ON (RELAY K1 ON)
RECORDING ON (RELAY K2 ON)
EDIT SW OFF (RELAY K1 OFF)
RECORDING OFF (RELAY K2 OFF)
A) VIDEO MODULATION
B) AUDIO HEAD
C) VIDEO HEAD
D) CONTROL HEAD
E) HEAD MOTOR CONTROL
F) ERASE HEAD
OFF
ON
PLAY BACK
RECORD
TAPE P.B. Sig.
BUFFER OSC. Sig.
RECORD Sig.
Time necessary to stabilize Video Mod. Amp. (0.1~0.5sec)
Time necessary to eliminate Erasure Noise (1~2sec.)
Time necessary to match phases of Buffer Osc. and Record Signal (less than 5sec.)
TIME

RELATIONSHIP OF OPERATIONAL TIMING


Edit SW on
1. Video Sig
2. Differentiated Wave-form of Rec. Shifter
3. Playback Cont. Sig.
4. Gate Signal
5. Head Motor Drive
6. Sync. Rec. Amp. output
7. Sync. Signal recorded on Tape
Driving by P.B.Signal
Driving by Buff. Osc. Sig.
Driving by newly recorded signal

DETAILED EXPLANATIONS ON THE MECHANISM

The followings are detailed explanations of the mechanism which will dominate the characteristics of the video tape recorder.
As it is well known, recording or reproduction of audio and video signals is unobtainable merely with the heads, tape and the other electrical elements. For tape feeding and for keeping the rotation of the rotating head in perfect relation, the mechanism becomes very critical and the aforementioned magnetic and electrical characteristics are only obtainable with proper mechanism.
Other than the rotating head assembly, all mechanism are similar to those of the regular audio tape recorders. However, the component parts are made with much more preciseness, severer than those for fine watches and cameras.
The followings are the nomenclatures of the component parts used in the NATIONAL VIDEO TAPE RECORDER.

MECHANICAL FUNCTION:

Record, Playback, Rewind and Stop are the most essential mechanical functions of every tape recorder. Besides them, there is a Fast Forward function. In operating these functions, NATIONAL MODEL NV–1020 and NV–1020E are provided with a pushbutton system which is easy to operate and of less trouble. Generally speaking, a recorder requires constant tape transportation speed because of which every recorder has a capstan drive system. This sysem is to rotate a capstan by means of a belt between the flywheel and the motor pulley. The capstan is to transport the tape at constant speed, and requires an accurate mechanism.

PRACTICAL FUNCTTION OF MECHANISM:

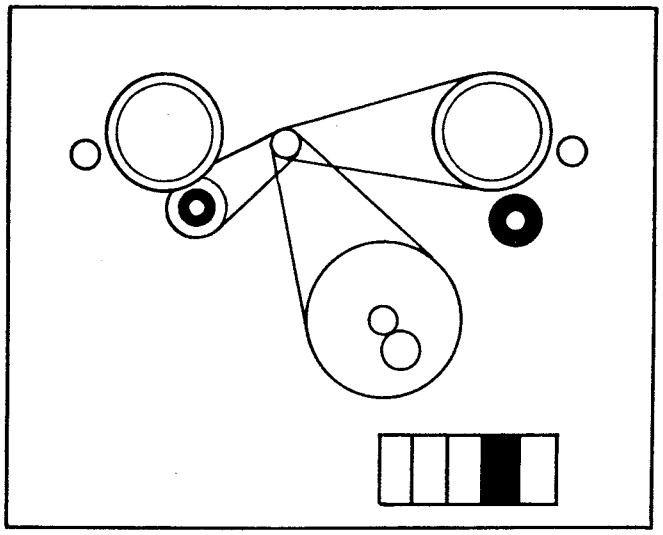
When AC power is applied, the capstan and head motors begin to rotate. The capstan motor is attached with motor pulley. Capstan flywheel, takeup reel hub and rewind idler are connected to each other by means of a belt. Therefore, when the capstan motor begins rotation, these satelite mechanical parts start rotation simultaneously. (If the tape tension arm is not engaged, the capstan motor does not rotate.)

1) PLAY:

When Play Button is depressed, the pinch roller engages the capstan and tape transportation begins simultaneously. The transported tape is wound by the takeup reel. The takeup reel hub is driven by a belt connected to the motor pulley. The reel pulley pushes the reel hub slightly upward by means of a clutch. The reel hub starts rotation by means of friction between felt placed on the surface of the reel pulley and reel hub. The takeup reel hub is provided with adequate torque so that tape tension is constant.

1) **PLAY:**

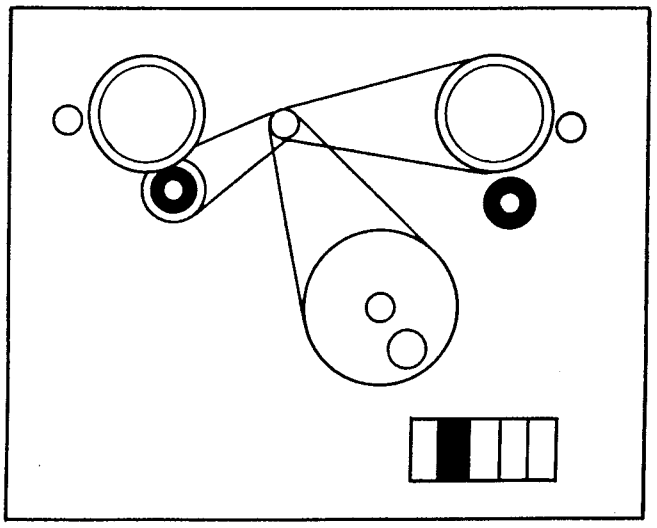
2) **RECORD:**



"RECORD" AND "PLAYBACK"

When Record button is depressed, the amplifier circuit only is switched. The tape is driven only when Record and Play buttons are depressed simultaneously. Therefore, Record and Play employ with the same mechanical motion, as it is essential to keep constant tape speed in recording and playing modes. Speed variations produce distorted picture and sound.

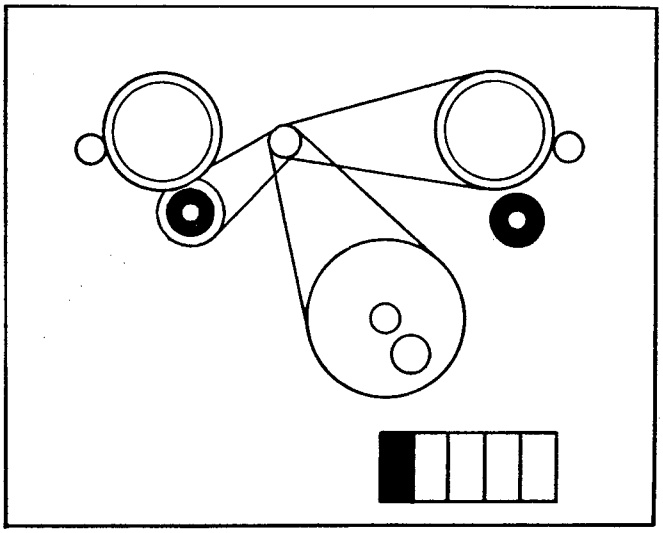
3) **REWIND:**



"REWIND"

When Rewind button is depressed, rewind idler contacts supply reel hub and the movement of a belt connected to the idler is relayed to supply reel hub. Back tension is applied to the rewind reel hub so that well-balanced speed between rewinding action and rewind reel is obtained. Pressure roller is disengaged from the capstan while Rewind button is depressed.

4) **STOP:**

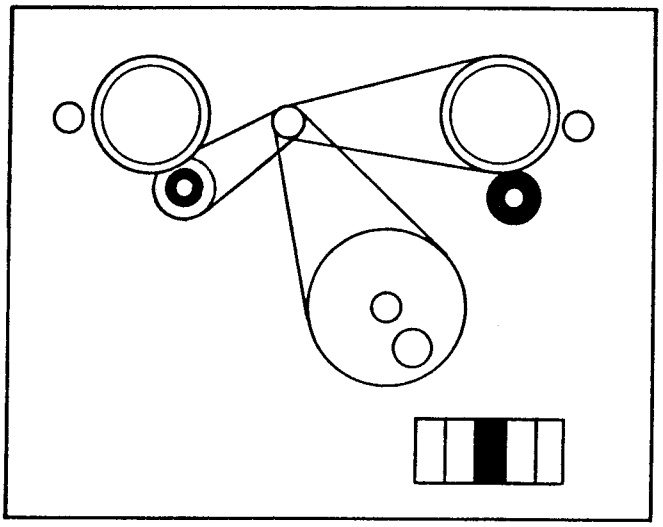


"STOP"

Fig. 47

When the tape is stopped by pressing Stop button, the pressure roller is disengaged from capstan and supply and rewind reel hubs are braked.

5) **FAST FORWARD:**



"FAST FORWARD"

Fig. 48

When Fast Forward button is depressed, the high-speed rotation of reel pulley driven by a belt of motor pulley is directly relayed to the Fast Forward roller. Supply reel hub has slight back tension as in record or play mode. Pressure roller is disengaged.

When Power Switch is "ON" position, both capstan motor and head motor rotate simultaneously. The video head bar is installed at the top of the shaft of the head motor. The head bar rotates inside of tape guide at approximate speed of 1,800 rpm (CCIR: 1,500 rpm), clockwise. While rotating, the video heads protrude slightly through the slit located along tape guide, and contacts the tape. Therefore, the tape guide must not be touched while the head motor is in operation. The output power of the 2 video heads is fed to the video amplifier by means of contact brushes and slip rings located at the center of the head bar. Tape is driven diagonally on the circumference of the tape guide from supply reel to takeup reel. On the tape guide, a tape supporter is attached so that the tape is transported correctly. The tapered posts located at both sides of the tape guide change the direction of tape, and require professional adjustment.

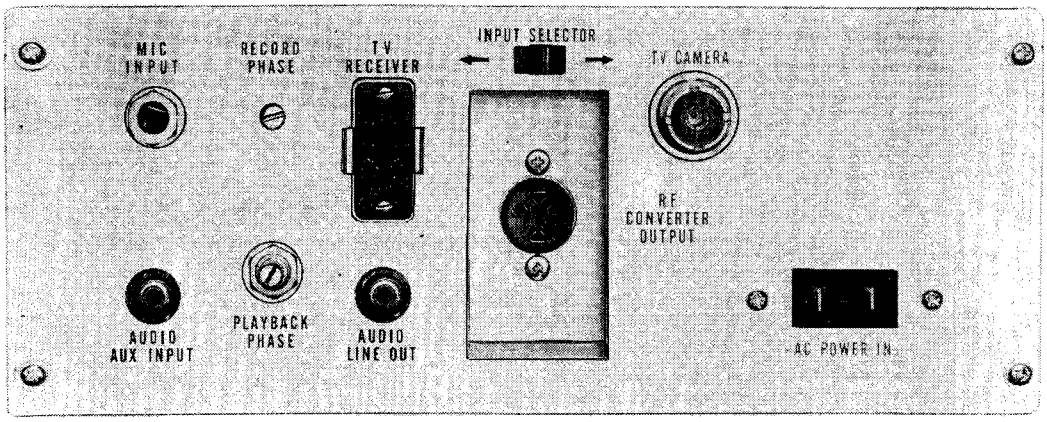
SPECIFICATIONS

For Models: NV-1020N
NV-1020D
NV-1020E
NV-1020ED

	NV-1020N/D	NV-1020E/ED
Power Source:	AC 117 Volts, 50 or 60 Hz	AC 220/240 Volts, 50 Hz
Power Consumption:	Approx. 160 Watts	Approx. 160 Watts
Video Recording System:	2 Rotary Heads, USA Standards (525 lines 60 Fields)	2 Rotary Heads, CCIR Standards (625 lines 50 Fields)
Video Modulation System:	Both Sideband FM	Both Sideband FM
Tape Speed:	30.3 cm (12 ips)	24.5 cm
Max. Reel Size:	17.8 cm (7 inch)	17.8 cm (7 inch)
Tape Width:	12.7 mm (1/2 inch)	12.7 mm (1/2 inch)
Heads:	Video: 2 Rotary Heads Audio/Control head: 1 Stationary Erase: 1 Full Track Erase Head: For Audio Dubbing	Video: 2 Rotary Heads Audio/Control head: 1 Stationary Erase: 1 Full Track Erase Head: For Audio Dubbing
Recording Time:	40 min. with NV-P71, 730 m (2,400 ft.)	46 min. with NV-P71, 730 m (2,400 ft.)
Horizontal Resolution:	More than 250 lines	More than 240 lines
Active Elements:	Fully Transistorized	Fully Transistorized
Frequency Response:	Video: Greater than 2 MC Audio: 80–10,000 c/s	Video: Greater than 2 MC Audio: 80–10,000 c/s
Signal to Noise Ratio:	Video: Better than 40 db Audio: Better than 40 db	Video: Betteer than 40 db Audio: Better than 40 db
Input Level:	Video: 0.5–1.5 Volt p-p Mic: 0.001 Volt (–60 db) Aux: 0.1 Volt (–20 db)	Video: 0.5–1.5 Volt p-p Mic: 0.001 Volt (–60 db) Aux: 0.1 Volt (–20 db)
Input Impedance:	Video: 75 ohm unbalanced Mic: 20 K ohm unbalanced Aux: 1 M ohm unbalanced	Video: 75 ohm unbalanced Mic: 20 K ohm unbalanced Aux: 1 M ohm unbalanced
Output Level:	Video: 1.0 Volt p-p (0 db) Audio: 0.1 Volt (–20 db)	Video: 1.0 Volt p-p (0 db) Audio: 0.1 Volt (–20 db)
Output Impedance:	Video: 75 ohm unbalanced Audio: 600 ohm unbalanced	Video: 75 ohm unbalanced Audio: 600 ohm unbalanced
Dimensions:	26.6 (H)—43.8(W)—42.5 (D) cm 10.5 (H)—17.25(W)—7.0 (D) inch	Same as NV-1020
Weight:	23 Kg (51 lb.)	Same as NV-1020
Standard Accessories:	7" Reel of Tape (730 m) 1 roll 7" Empty Reel 1 pc. AC Cord (2 m) 1 pc. Connecting Cable for Monitor (1.5 m) 1 pc. Video Splicing Tape (30 cm) 1 roll	Same as NV-1020

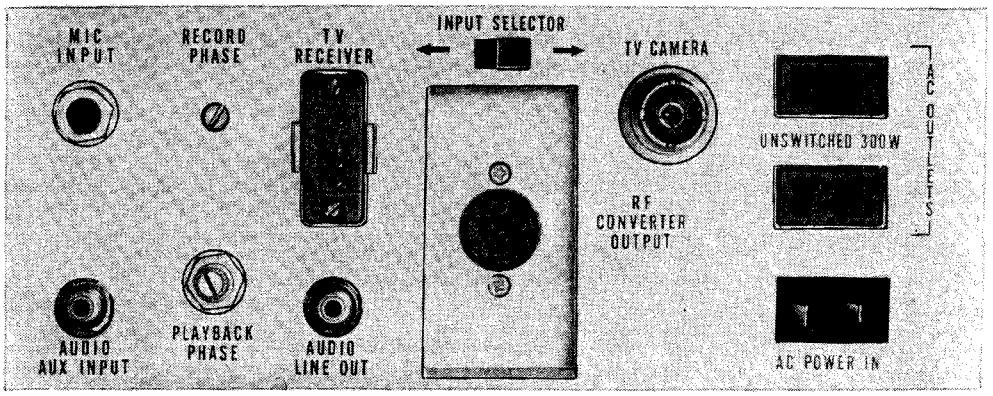
OPERATING INSTRUCTIONS

INSTALLATION



JACK PANEL (NV-1020D)

Fig. 49



JACK PANEL (NV-1020E/ED)

Fig. 50

BASIC CONNECTIONS

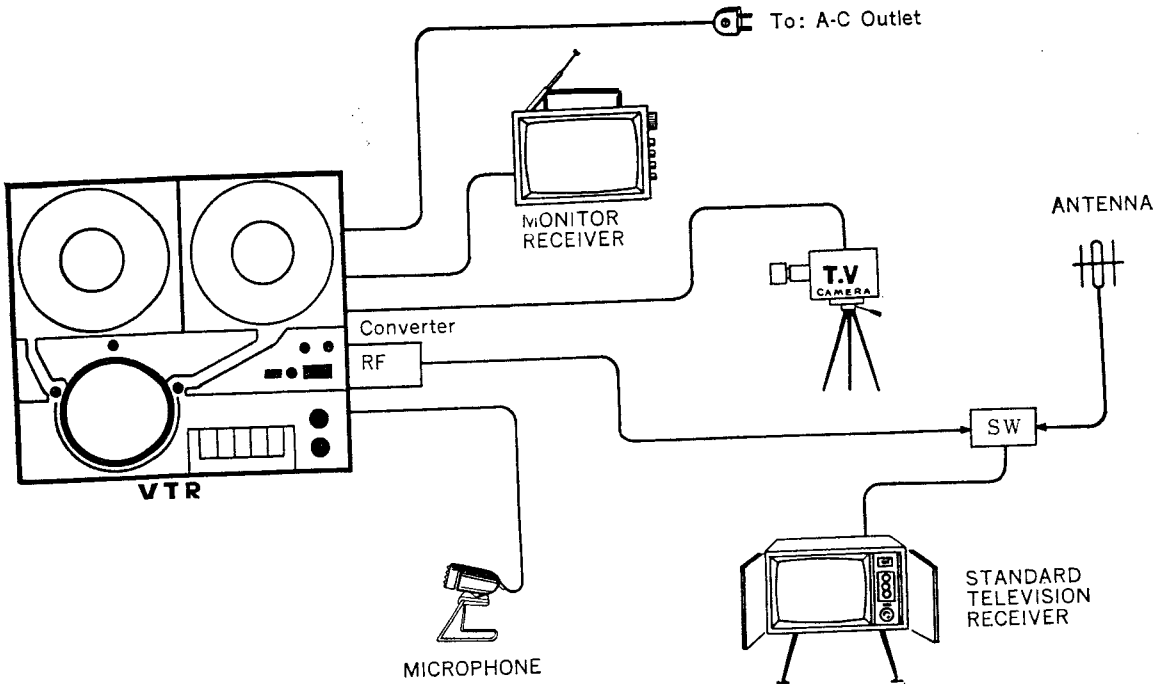


Fig. 51

MONITOR TELEVISION

When the MONITOR TELEVISION is used, connect it to the VTR by means of the cable provided and set the selection switch on the left side of the TV set to "VTR". When the switch is moved to "TV", the monitor becomes a conventional TV receiver.

TV CAMERA

See operating instructions included with TV Camera.

VTR

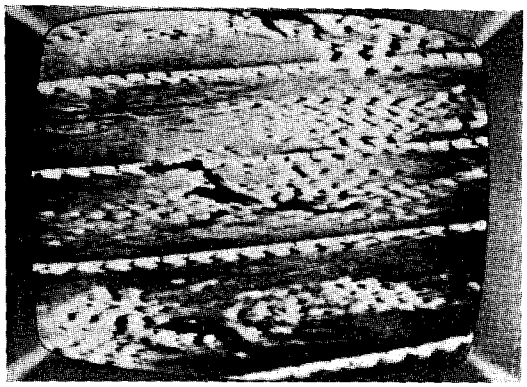
A. ON THE FRONT PANEL, LEVEL CONTROLS FOR RECORDING BOTH PICTURE AND SOUND, A TAPE COUNTER, A HEAD-CLEANING BUTTON AND VARIOUS FUNCTION PUSHBUTTONS ARE PROVIDED.

B. SOUND RECORDING ADJUSTMENT AND POWER SOURCE:

Turn the AUDIO level control knob to the CW to turn power "on". Then depress the "RECORD BUTTON" and the point of the level meter begins to swing. Try to set the level so that the needle deflects within the black zone during peak volume of the source material.

C. RECORDING PICTURE ADJUSTMENT:

Turn the VIDEO level control knob to the CW while observing the monitor in order to increase modulation level. An excessive modulation will produce stripes on the screen as shown in Fig. 52 The most desirable recording level is the point just before the stripes appear on the screen.



Excessive Record Level
(Overmodulation)

Fig. 52

D. TAPE COUNTER:

The tape counter consists of 3 digits and shows relative recording time. By depressing the white button located at right side of the tape counter, the figures return to zero. Make sure not to re-set the counter while recording.

E. RECORDING AND PLAYING BUTTONS:

When Record Button (Black) is depressed, the tape does not start, but the picture to be recorded appears on the screen of the Monitor. By observing the picture, adjust for the proper recording level. When the adjustment is made, depress Record and Play Buttons simultaneously. After rewingdin, press the play button to reproduce the recorded picture and sound on either the monitor.

F. FAST FORWARD/REWIND BUTTON:

For fast forwarding or rewinding tape.

G. STOP BUTTON:

To stop tape transportation mechansim.

H. HEAD-CLEANER BUTTON:

Depress the head-cleaner button 2 or 3 times when recording or playing cannot be made properly because of head clogging. This is to be done when the video heads are rotating. But do not depress the button so often, for the head is made of Ferrite. Otherwise, the head may severely be damaged.

I. 50 CPS SOURCE:

NATIONAL VIDEO TAPE RECORDER is factory-adjusted for 60 Hz (Power Characteristics), American TV System, and for 50 Hz, CCIR TV System. Therefore, in the area where 50 Hz American TV System is standard, place the 50 Hz Capstan Sleeve on the capstan shaft as instructed in the Operating Instructions.

The recorder can not be used in 60 Hz CCIR TV System area.

J. R-PHASE AND P-PHASE:

NOTE:R-Phase can not be adjusted without a screw driver.

Two controls for R-Phase and P-Phase are provided on the jack panel at right side of the recorder. R-Phase is to change the head switching position. The head switching line is only observed on the reproduced picture. Turn the vertical hold knob on the TV set to make a blanking signal locate at the center of the screen then, adjust R-Phase to keep the head switching line within 3 to 5H (about 5 mm on 9; TV set) above the blanking signal by repeating recording and playing in the above-mentioned state. P-Phase is to be set at the position where the reproduced picture quality becomes the best.

Note: These two controls are carefully adjusted at the factory so it is not recommended for the user to re-adjust these except for the following occasions:

a. R-Phase:

When the recorder is repaired (the adjustment of R/P Phase should be refered to the authorized VTR serviceman).

b. P-Phase:

When the tape has been recorded on the same machine, the playback shifter needs not to be adjusted as the NATIONAL video tape recorder plays back the tape perfectly when the playback shifter is preset to AUTO position (turn the shifter counter-clockwise until the click is heard). Turn the shifter only when;

i) Playing the tape recorded by other VTR,
ii) Playing old tape,
iii) The power source voltage is suddenly altered, or
iv) The S/N of the recorded picture is excessively poor.

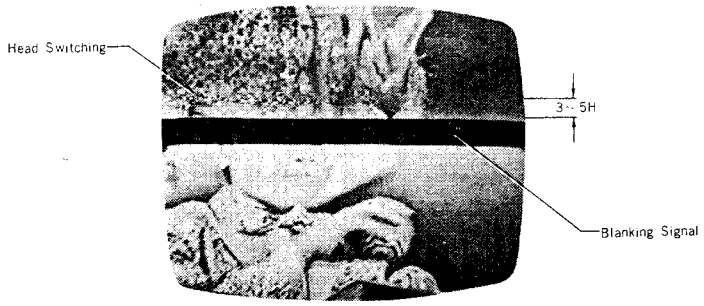


Fig. 53 Head Switching Position Adjustment

Fig. 54

MAINTENANCE

To obtain the best performance from the VTR, it is important that the oxide residue from the tape must be cleaned from the heads periodically.
Make sure not to magnetize the heads and tape so as to avoid malfunction in recording and playing.

1. Before using the recorder, lean the tape path in the following manner:

A. Cut the power "off" and slack the tape.

B. The cleaning of video heads can be done after the top panel is removed. Benzol or Trichloro-Trifluoroethane ($C_2Cl_3F_3$) is suitable as a cleaning fluid. However, the utmost care must be taken to avoid any excessive pressure on the heads ($C_2Cl_3F_3$ is known as Freon Refrigerant).

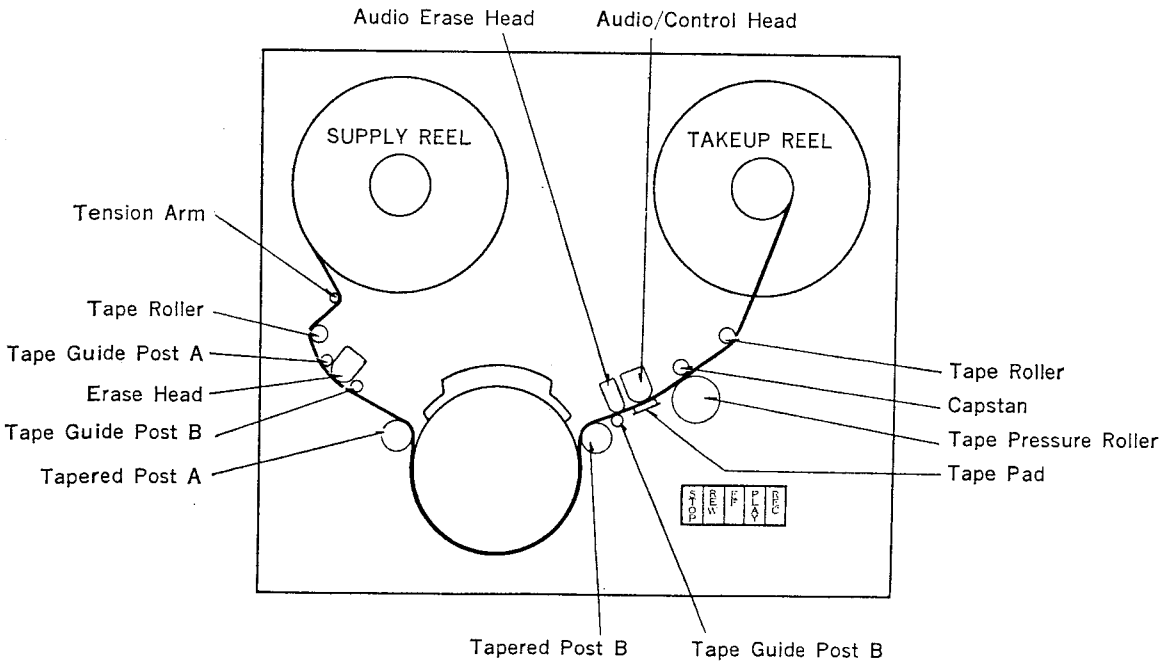
C. Clean the posts, tape drum, audio control heads with chamois.

2. Demagnetization of Heads:

Avoid bringing a magnet close to the video heads or testing the heads by means of a tester to avoid undesirable magnetization.

If erroneously the video heads are magnetized, demagnetize as follows:

Using a demagnetizer, after stopping heads completely, connect the A-C cord of demagnetizer to the A-C outlet and then bring the demagnetizer close to the surface of the head for 2 or 3 seconds. After that, take it slowly way from the head to about one foot and disconnect the A-C plug.



TAPE THREADING

Fig. 55

MECHANISM ADJUSTMENTS

TO REMOVE TOP PANEL:

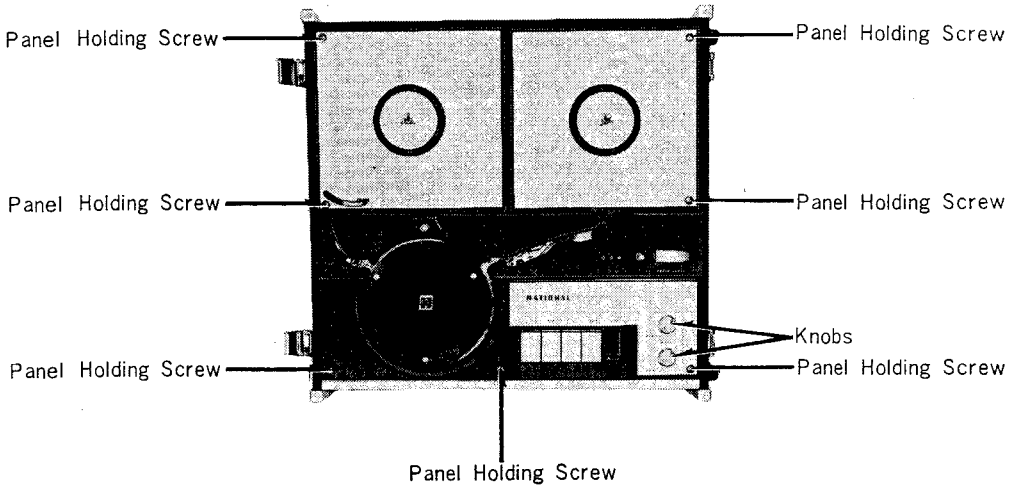


Fig. 56

1. Pull out all control knobs.
2. Pull out the head mount.
3. Unscrew 7 panel holding screws, then the top panel can be removed.

TO REMOVE DECK FROM CABINET:

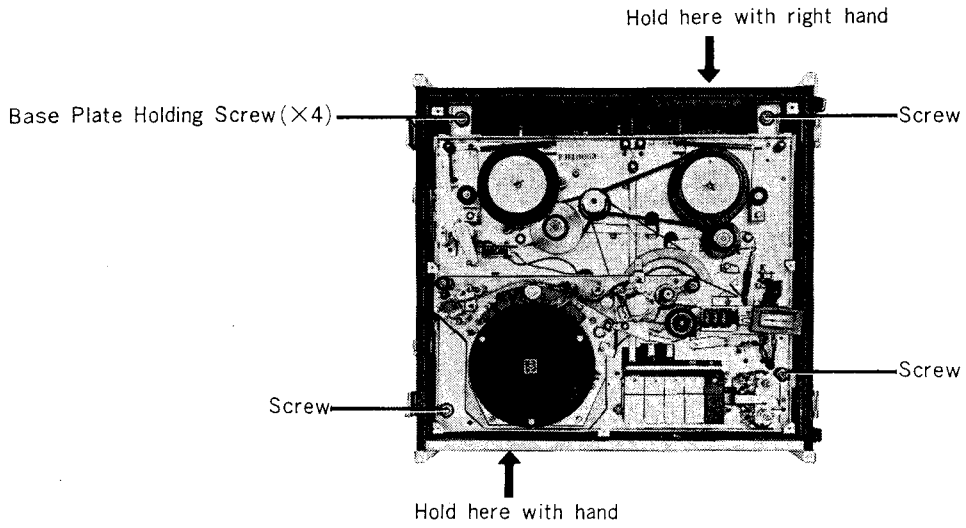


Fig. 57

1. Unscrew and remove four screws.
2. Pull the mechanism out from the cabinet with care.

TO REPLACE VIDEO HEAD BAR ASSEMBLY

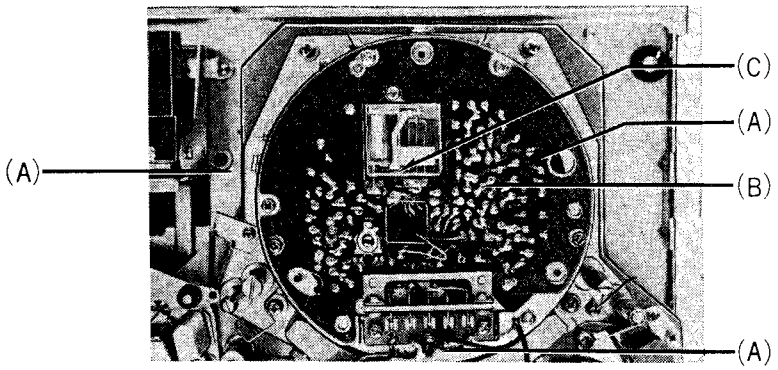


Fig. 58

1. Turn off the AC power source and wait until the rotation of the video head assembly makes a complete stop.
2. Remove the Head Cap by taking off the three screws.
3. Unsolder the connections (C) to the Sliprihg Brush and remove the R/PB Amplifier (B) by taking off three screws (A).
4. Remove R/PB Amplifier Spacer (D) by unscrewing three screws.
5. Remove Slipring Brush Assembly (E) by taking off three screws.
5. Revome Slipring Brush Assembly (E) by taking off three screws.
6. Remove Head Cleaner Assembly by removing two screws.
7. Unsolder the connection (G) from the Slipring to the Head Bar and remove the Slipring by taking off the two screws (F).
8. Remove the Centering Pin (H) equipped under the Slipring.

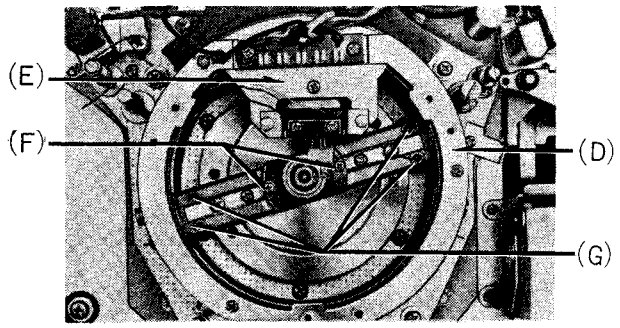


Fig. 59

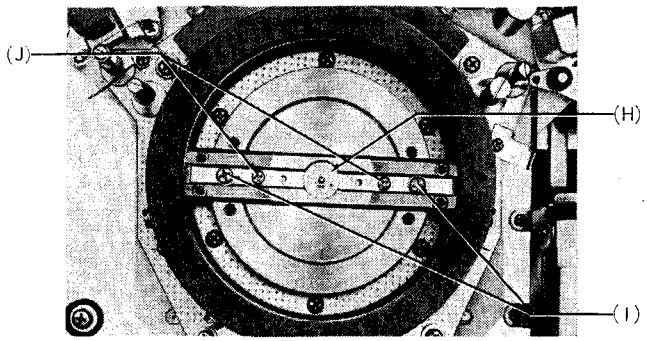


Fig. 60

9. Remove two screws (1) holding the Head Bar to the Disc of the Head Motor.
10. Extreme care should be taken when removing the Bar from the Tape Guide Drum.
    Rotate the Bar slowly by hand until one end of the Bar comes to the hole for Head Cleaner and lift another end up as described in Fig. 60. Insert the end into the hole of Head Cleaner until the another end disengages from the Head Drum. And remove the entire Head Bar Assembly from the housing. Do not contact the Video Head with any object in the process of servicing.

11. Clean up the inside of the Tape Guide Drum Housing and the surface of the motor disc on which the Bar is mounted.
12. Locate the new Head Bar Assembly. Refer to the item 10 for easy installment of the Bar. Do not allow any object touch the Chip of the Video Head.
13. Install the Bar with two screws (1) temporarily after placing the Centering Pin at the center of the Bar. Confirm the smooth rotation of the Bar.
14. Measure the head protrusion amount following the instructions below.

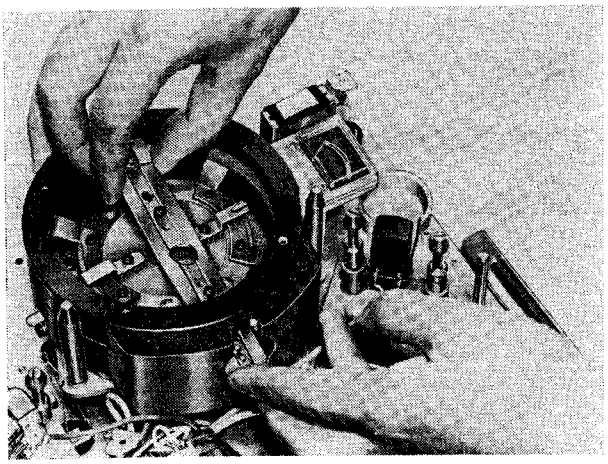


Fig. 61

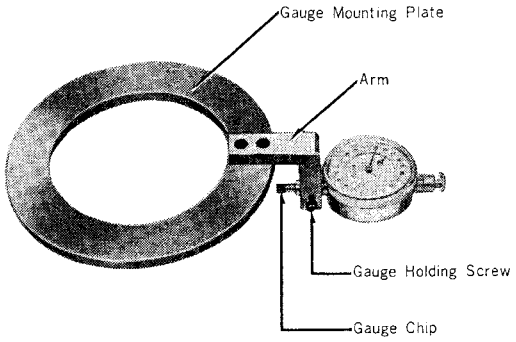


Fig. 62 Protrusion Gauge

i) Set the gauge at point A (Fig. 64) as below and rotate the Bar manually to make a slight contact with the gauge chip, and read the protrusion amount of both video heads. Adjust the tolerance of both video heads for 10 microns (1/100 mm) with the protrusion amount within the range of 70 microns to video heads for 10 microns (1/100 mm) with the protrusion amount within the range of 70 microns to 100 microns. The adjustment can be made by adjusting the two screws (1) described in Fig. 60.
ii) Place the gauge at point B and follow the instructions noted above and then at the point C adjust the both video head for the protrusion amount rated in i) above.

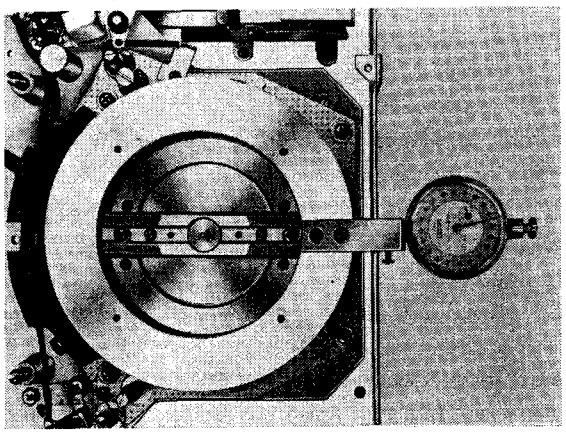
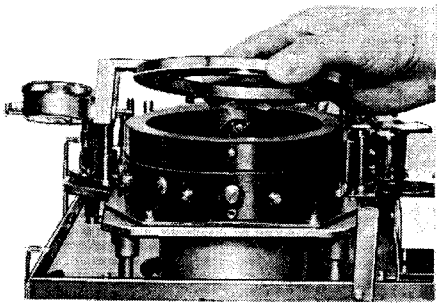


Fig. 63



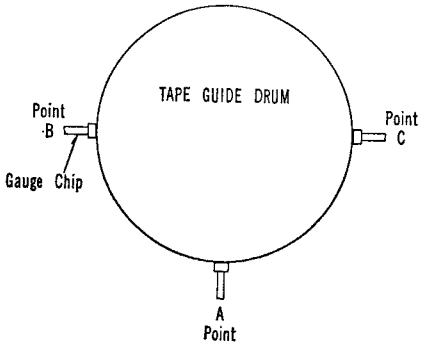
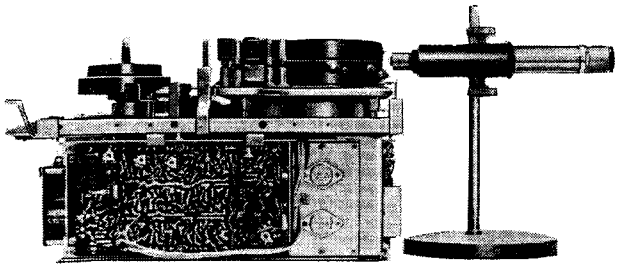


Fig. 64

15. After finishing the protrusion measurement, the Video Head Height must be adjusted with use of a microscope (magnification 50).
    Do not have the microscope touch with the Video Head to avoid inadvertent damage to the Video Heads.



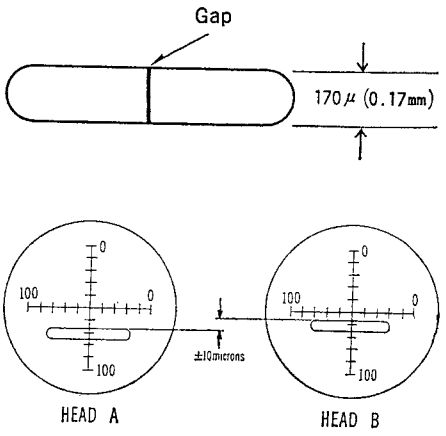


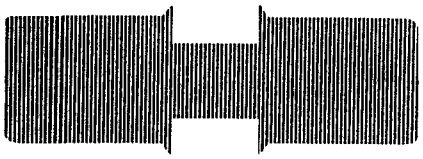
Fig. 65

16. Focus on the Video Head Chip in the scope and adjust the height of each head to obtain the tolerance of 10 microns (Fig. 65). This adjustment is made by turning the screws (J) (Fig. 60).
17. After finishing the whole adjustment procedures above, be sure to lock the screws with the lock paint. Do not energize the Video Head Motor until the lock paint is dried up.
18. Install the Slipring Assembly and connect the wiring refering to the item 7 before.
19. Install the Head Cleaner Assembly with two screws. Rotate the Heads manually to confirm the smooth rotation with the Cleaner Button depressed.
20. Place the Slipring Brush Assembly and R/PB Amp. Spacer on the Tape Guide Drum and fix them with screws.
21. Then, adjust the R/PB Amplifier as follows;
    i) Demagnetize the Video Head before proceeding with the following steps.
    ii) Connect the oscilloscope probe to TP501 and push REC button and turn the Video Level Control to make the video intput zero.
    iii) Set the R502 (100 Ω) and R517 (100 Ω) semi-fixed variable resistors at minimum position by turning CCW.
    iv) Place the recorder into PB mode and turn at first R502 slowly CW to record the signal of 50, 60, 70, 80 and 90 m Vp-p on tape while recording the voice clarifying each amplitude for later reference.
    v) Connect the oscilloscope probe to TP303 or Video Output terminal No. 4 and place the recorder into PB mode to reproduce the recorded signals. Find out the maximum amplitude among the recorded signals.

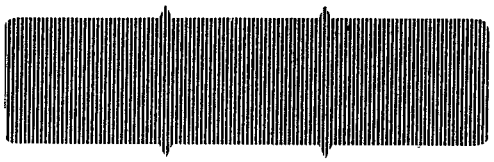
vi) Turn another resistor R517 and adjust for maximum amplitude while observing the TP303 wave form

vii) After finishing above adjustments, readjust the semi-fixed resistors for maximum amplitude.

viii) Adjust R529 for flat output as shown below.



Before adjustment



After adjustment

xi) If the waveform appears as shown in Fig. 66, the Tape-to-Head contact (Head protrusion amount) is not sufficient at;

a) the center of the Tape Guide Drum
b) the Tape inlet
c) the Tape inlet or outlet, or at
d) the Tape outlet

x) If the head protrusion is normal and the tape transports in normal condition, and still the trouble mentioned in xi above persists, lap the video heads with 4000 mesh lapping tape for a few seconds. Give a similar tension to the lapping tape as the video tape gives in normal transport. (Fig. 67)

xi) Confirm normal recording and playback. If the tracking noise appears on the monitor TV while playing back, turn the Piayback shifter to eliminate the noise. When the trouble still persists, move the Audio/Control Head Alignment left or right slightly (maximum 2.5 mm) by unscrewing the two screws shown in Fig. 68.

xii) Lock the semi-fixed resistors R502, R517 and R529 with lock paint.

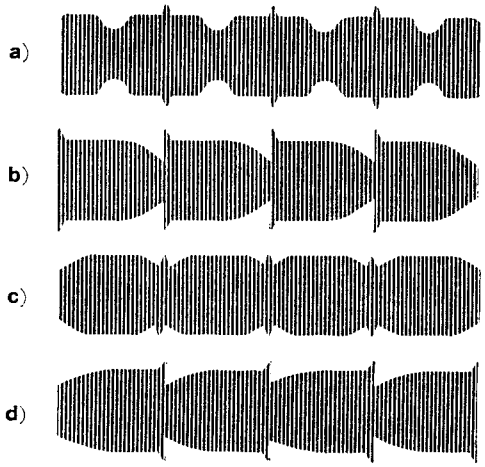


Fig. 66

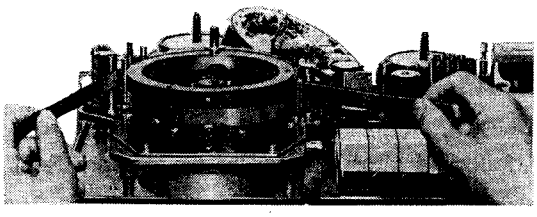


Fig. 67

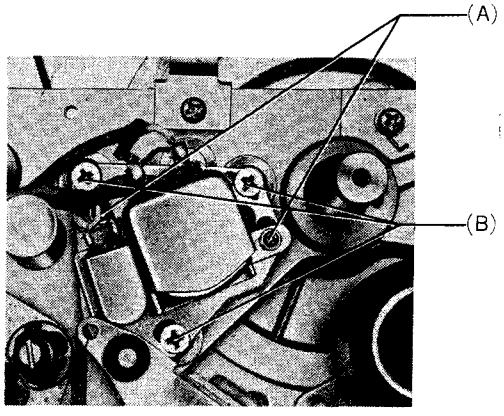


Fig. 68

FAST FORWARD ROLLER:

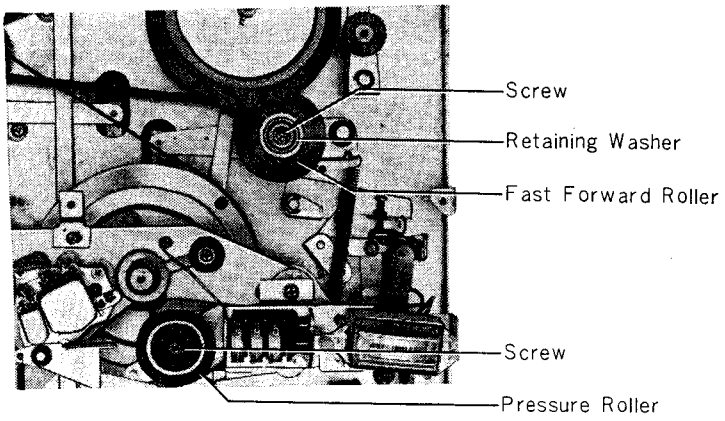


Fig. 69

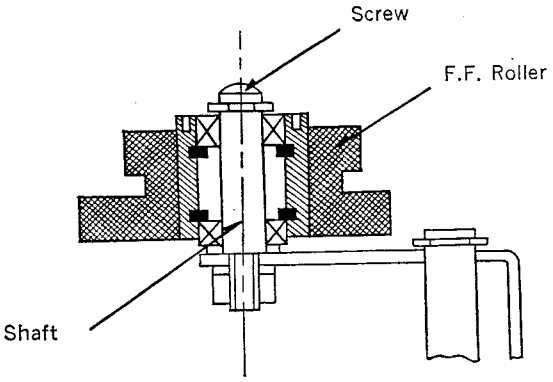


Fig. 70

How to disassemble

1. Remove Screw and Washer.
2. Take out F.F. Roller from F.F. Roller Shaft.

NOTE: The above procedure must be followed after removal of the Take up Reel Hub.

REWIND PULLEY:

How to disassemble

1. Unscrew and remove screw (1).
2. Remove Spring Washer (2) and Washer (3).
3. Disengage Rewind Belt (5).
4. Take out Rewind Pulley (4) from Rewind Pulley Shaft with (6) care.

NOTE: The above procedure must be followed after removal of the Supply Reel Hub.

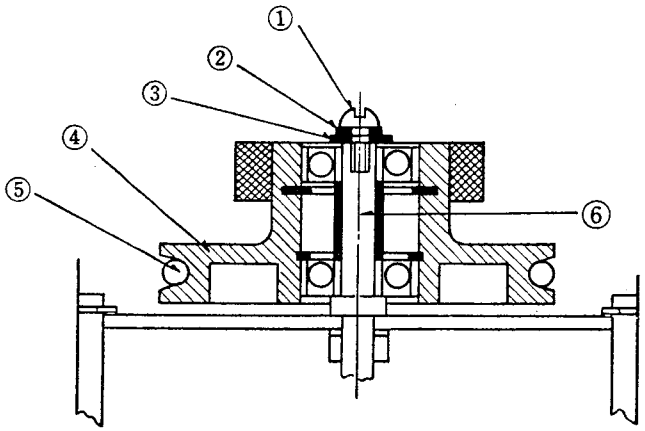


Fig. 71

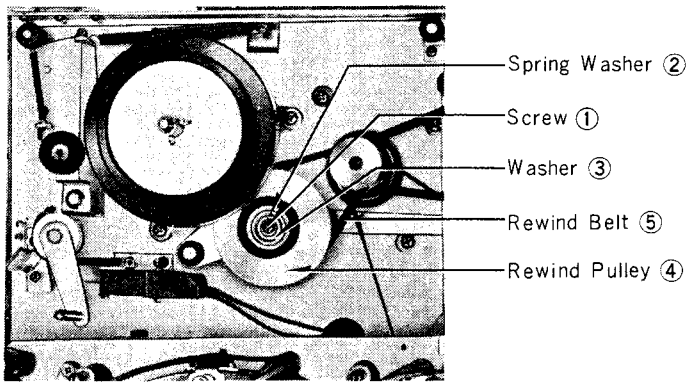


Fig. 72

PRESSURE ROLLER

How to disassemble

1. Unscrew and remove screw.
2. Remove Retainer.
3. Take out Pressure Roller from Pressure Roller Shaft.

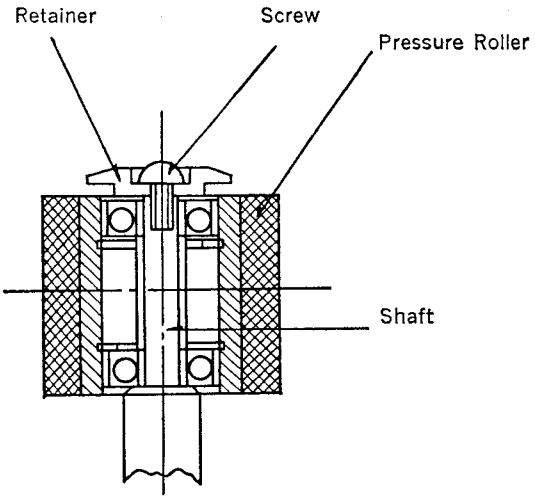


Fig. 73

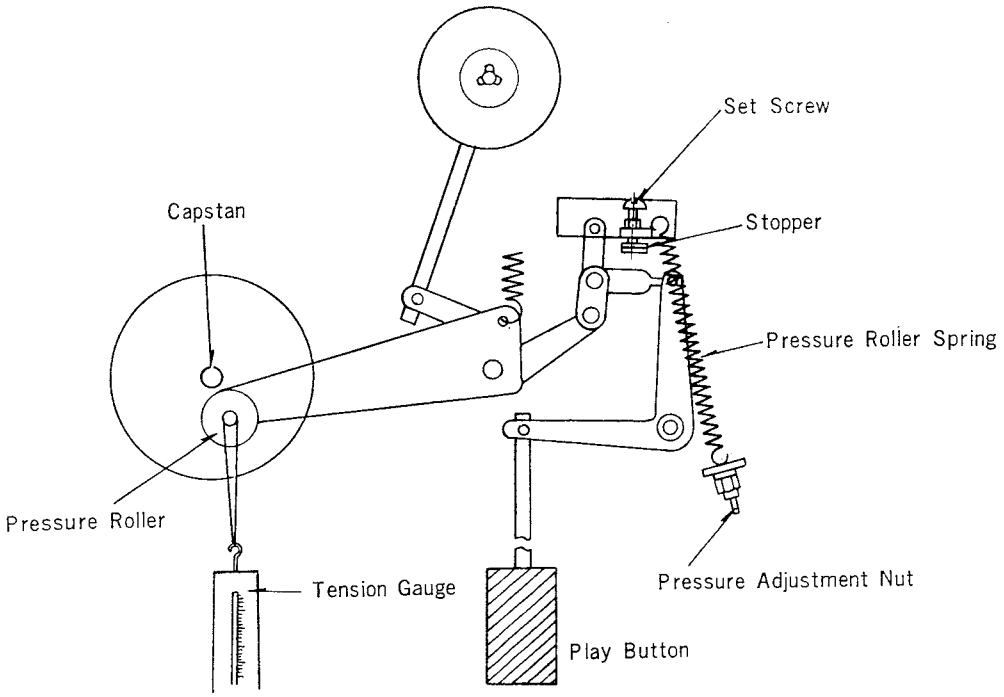


Fig. 74

Adjustment

1. Proper pressure between Pressure Roller and Capstan is about 1,800–2,000 grams (about 4–4.4 lbs.). Pressure can be adjusted by turning the Pressure Roller pressure adjustment nut. However, this adjustment must be done after loosening the set screw.
2. Depress PLAY Button so that the Pressure Roller engages against Capstan and turn the set screw until the screw and contacts the stopper.
3. Shaft of Pressure Roller must be adjusted parallel to Capstan.

REEL HUB ADJUSTMENT:

1. Supply Reel Hub:

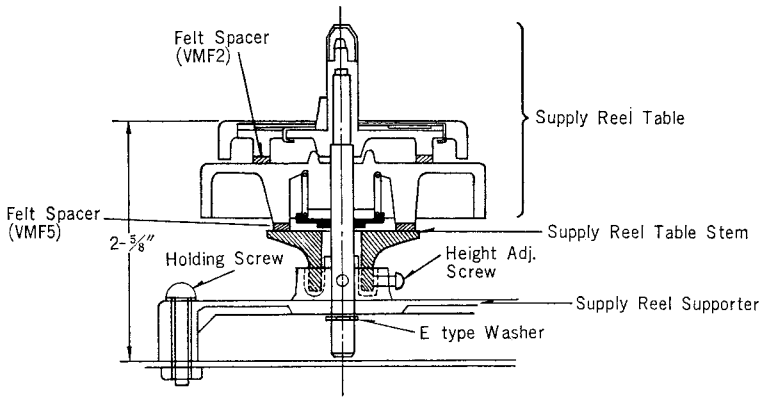


Fig. 75

A. Height can be adjusted by turning the height adjustment screw. Proper height is about 67 mm (about 2–5/8″).

B. Lubrication to reel hub shaft bearing and felt must be made. (It is recommended to use "Spindle Oil # 34″ produced by ESSO.)

Caution: When installing the supply reel hub on the deck, mount the base so as to meet the figures both on the deck and the reel base to secure the right rotation of the reel. (See Page on the Parts Breakdown List)

2. Takeup Reel Hub:

VTR in the STOP mode creates the gap "a", disengaging Take Up Reel Table from Take up Reel Pulley.

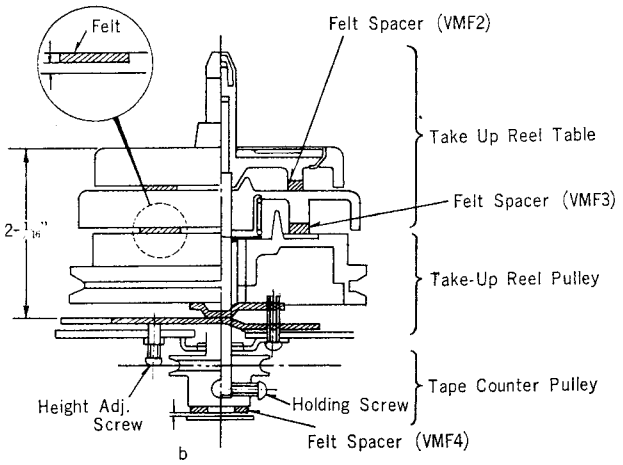


Fig. 76

A. Height can be adjusted by turning the height adjustment screw. Proper height is about 52 mm (about 2–1/16″) in Record or playback mode.

B. The gap "a" must be kept over 0.3 mm (about 1/64″) with the recorder in the STOP mode and the gap "b" over 0.5 mm (about 3/128″) when VTR is in REC or PB mode.
This can be done by turning the Counter Pulley holding screw.

C. Felt must be oiled with high viscosity oil such as Silicone Oil.

C. Confirm rotation of Takeup Reel Table when REC or PB button is depressed, and rotation ceases with VTR in STOP mode.

LUBRICATING PROCEDURE

The mechanical parts of a Video Tape Recorder need lubricating at least once in every 500 hours of playing time. There are five (5) main oilling places and three (3) different types of oil which should be used.

When lubricating the unit, the technician should be extremely careful to prevent any oil or grease dripping on the belts, brakes, or the brake surfaces. All surfaces that contact the tape directly must be oil free. Should oil or grease be deposited accidentally on any of these surfaces or parts, the technician should clean them thoroughly with a solvent, such as freon TF solvent.

Any oil left on these surfaces will adversely affect the machine's performance.

RECOMMENDED OILS ARE:

#1 DTE Heavy Medium
#2 Mobilux Grease #2 Brown
#3 Lubriplate Aero

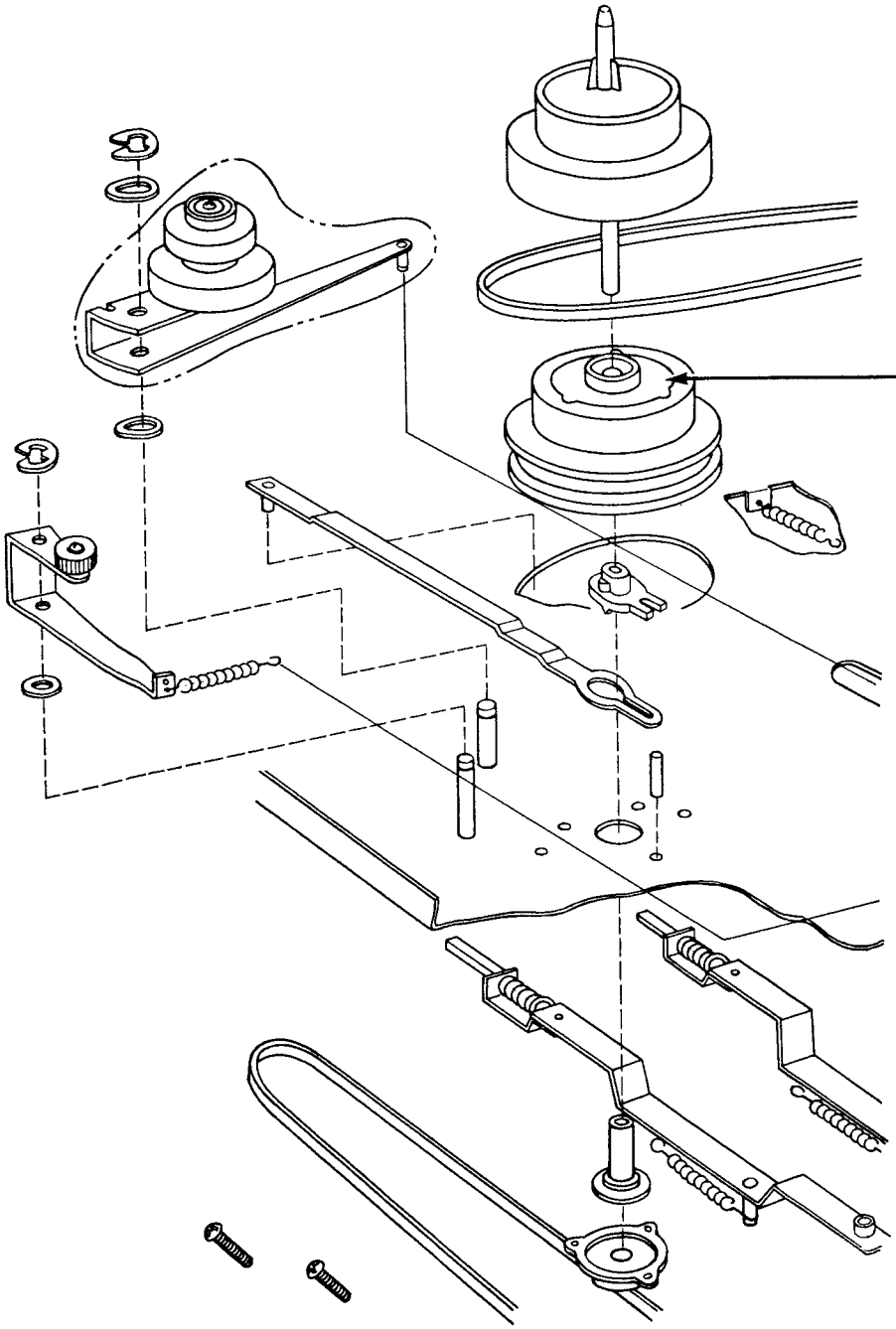
AVAILABLE FROM:

Mobil Oil Company

PARTS TO BE OILED:

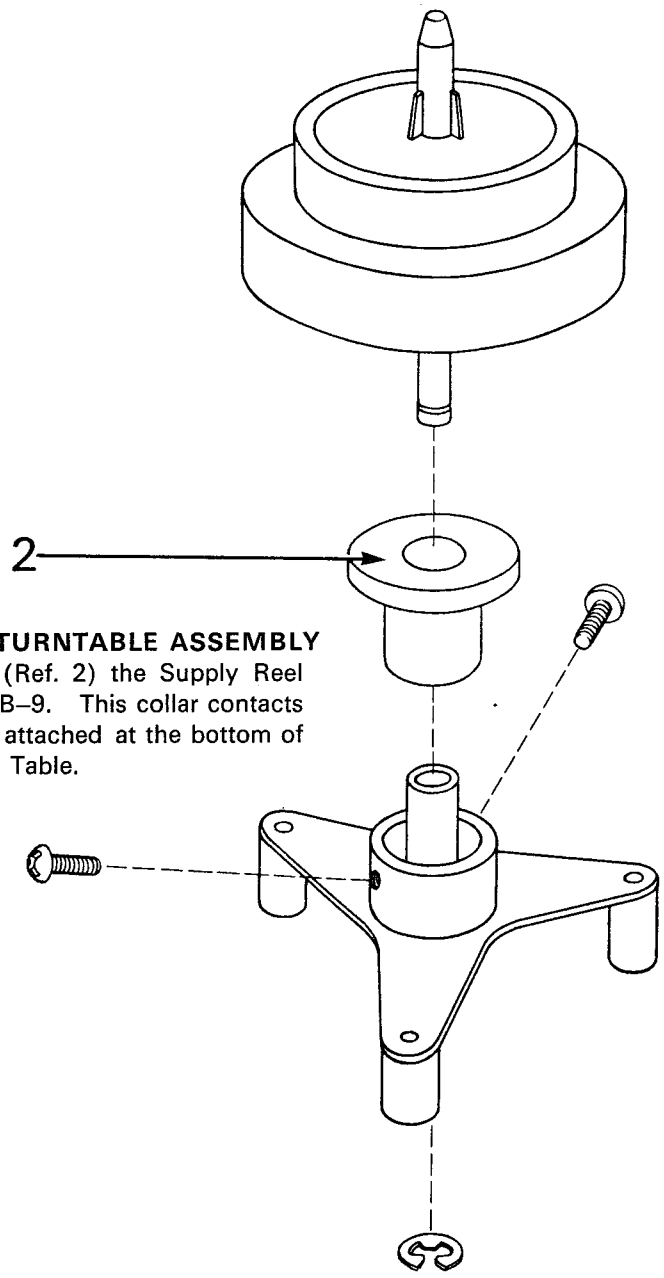
A) Levers, Rods, Arms, etc.
Use #2 oil on these mechanical parts and other friction producing parts throughout the machine.
B) CAPSTAN SHAFT
C) TAPE ROLLER SHAFT
C) TAPE ROLLER SHAFT
D) TAKE-UP REEL PULLEY
E) SUPPLY REEL TURNTABLE ASSEMBLY

See separate page for each.



TAKE-UP REEL PULLEY

Use oil # 2 on the spacer on top of the Take-Up Reel Pulley.



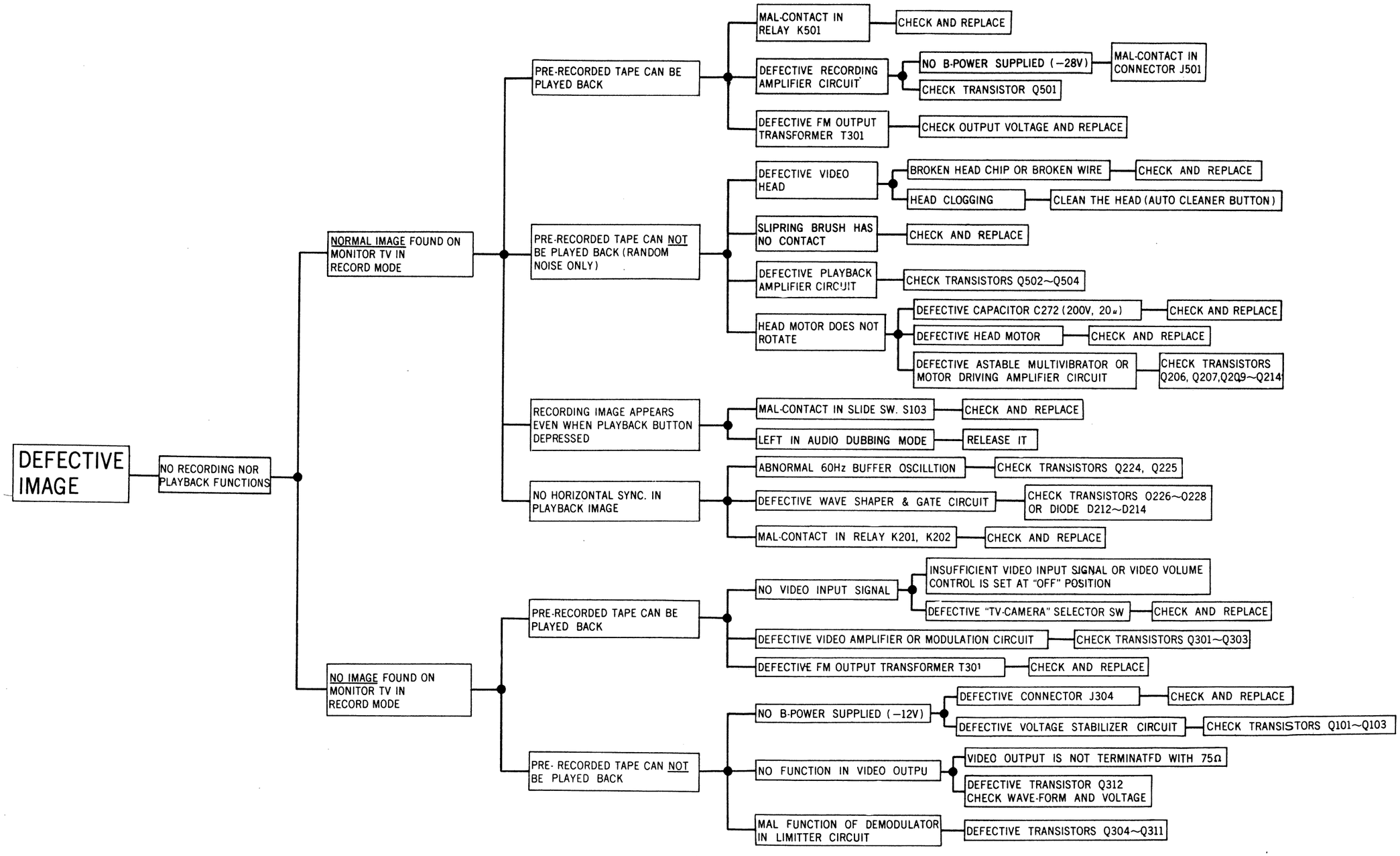
SUPPLY REEL TURNTABLE ASSEMBLY

Use oil #2 on (Ref. 2) the Supply Reel Table Collar VDB–9. This collar contacts the felts spacer attached at the bottom of the Supply Reel Table.

TROUBLE SHOOTERS' GUIDE : 1

DEFECTIVE "VIDEO":

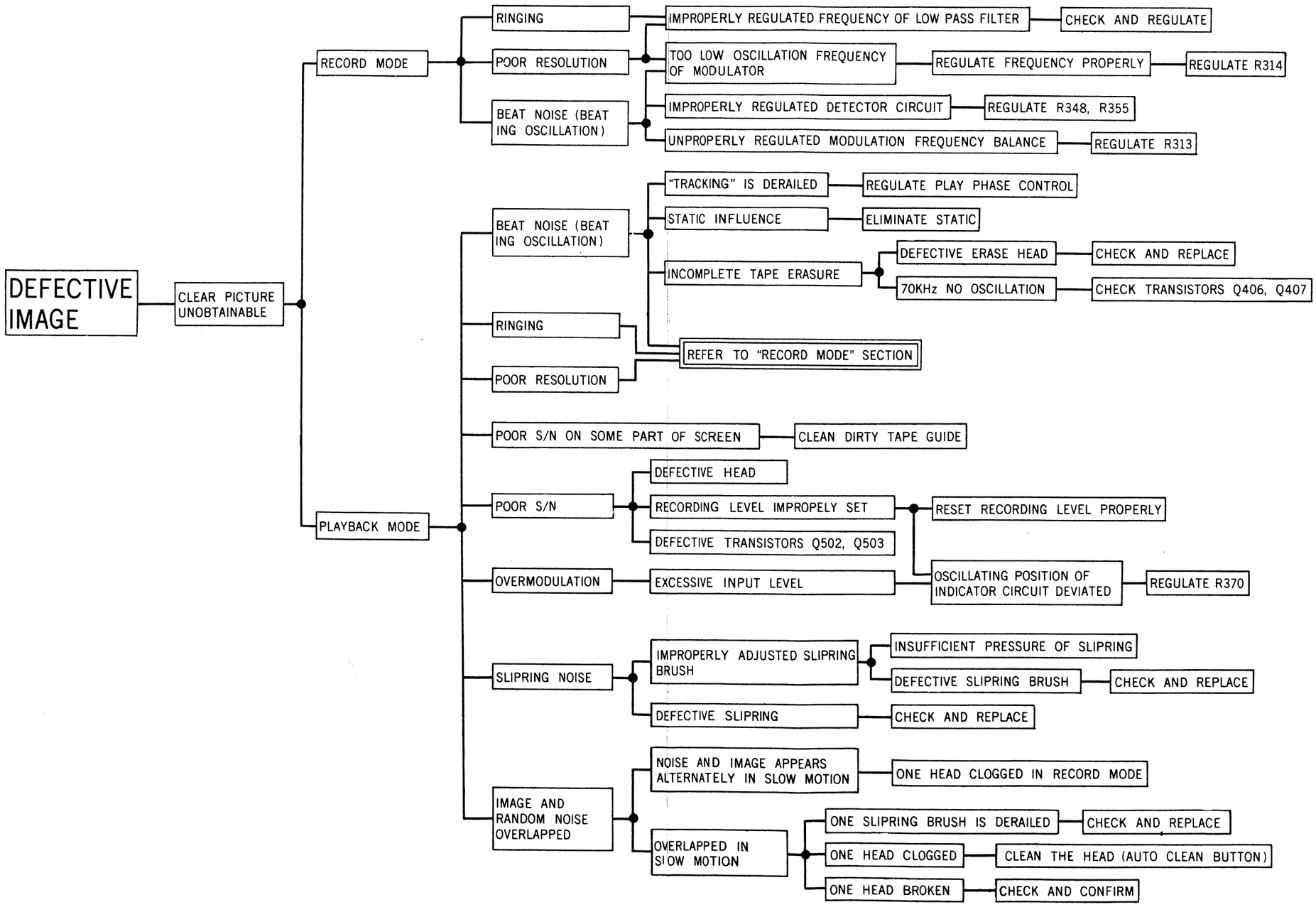
NO RECORDING NOR PLAYBACK:


DEFECTIVE IMAGE
NO RECORDING NOR PLAYBACK FUNCTIONS
NORMAL IMAGE FOUND ON MONITOR TV IN RECORD MODE
PRE-RECORDED TAPE CAN BE PLAYED BACK
MAL-CONTACT IN RELAY K501
CHECK AND REPLACE
DEFECTIVE RECORDING AMPLIFIER CIRCUIT
NO B-POWER SUPPLIED (−28V)
MAL-CONTACT IN CONNECTOR J501
CHECK TRANSISTOR Q501
DEFECTIVE FM OUTPUT TRANSFORMER T301
CHECK OUTPUT VOLTAGE AND REPLACE
PRE-RECORDED TAPE CAN NOT BE PLAYED BACK (RANDOM NOISE ONLY)
DEFECTIVE VIDEO HEAD
BROKEN HEAD CHIP OR BROKEN WIRE
CHECK AND REPLACE
HEAD CLOGGING
CLEAN THE HEAD (AUTO CLEANER BUTTON)
SLIPRING BRUSH HAS NO CONTACT
CHECK AND REPLACE
DEFECTIVE PLAYBACK AMPLIFIER CIRCUIT
CHECK TRANSISTORS Q502~Q504
HEAD MOTOR DOES NOT ROTATE
DEFECTIVE CAPACITOR C272 (200V, 20㎌)
CHECK AND REPLACE
DEFECTIVE HEAD MOTOR
CHECK AND REPLACE
DEFECTIVE ASTABLE MULTIVIBRATOR OR MOTOR DRIVING AMPLIFIER CIRCUIT
CHECK TRANSISTORS Q206, Q207, Q209~Q214
RECORDING IMAGE APPEARS EVEN WHEN PLAYBACK BUTTON DEPRESSED
MAL-CONTACT IN SLIDE SW. S103
CHECK AND REPLACE
LEFT IN AUDIO DUBBING MODE
RELEASE IT
NO HORIZONTAL SYNC. IN PLAYBACK IMAGE
ABNORMAL 60Hz BUFFER OSCILLTION
CHECK TRANSISTORS Q224, Q225
DEFECTIVE WAVE SHAPER & GATE CIRCUIT
CHECK TRANSISTORS Q226~Q228 OR DIODE D212~D214
MAL-CONTACT IN RELAY K201, K202
CHECK AND REPLACE
NO IMAGE FOUND ON MONITOR TV IN RECORD MODE
PRE-RECORDED TAPE CAN BE PLAYED BACK
NO VIDEO INPUT SIGNAL
INSUFFICIENT VIDEO INPUT SIGNAL OR VIDEO VOLUME CONTROL IS SET AT "OFF" POSITION
DEFECTIVE "TV-CAMERA" SELECTOR SW
CHECK AND REPLACE
DEFECTIVE VIDEO AMPLIFIER OR MODULATION CIRCUIT
CHECK TRANSISTORS Q301~Q303
DEFECTIVE FM OUTPUT TRANSFORMER T301
CHECK AND REPLACE
PRE- RECORDED TAPE CAN NOT BE PLAYED BACK
NO B-POWER SUPPLIED (−12V)
DEFECTIVE CONNECTOR J304
CHECK AND REPLACE
DEFECTIVE VOLTAGE STABILIZER CIRCUIT
CHECK TRANSISTORS Q101~Q103
NO FUNCTION IN VIDEO OUTPU
VIDEO OUTPUT IS NOT TERMINATFD WITH 75Ω
DEFECTIVE TRANSISTOR Q312 CHECK WAVE-FORM AND VOLTAGE
MAL FUNCTION OF DEMODULATOR IN LIMITTER CIRCUIT
DEFECTIVE TRANSISTORS Q304~Q311

TROUBLE SHOOTERS' GUIDE : 2

DEFECTIVE "VIDEO":

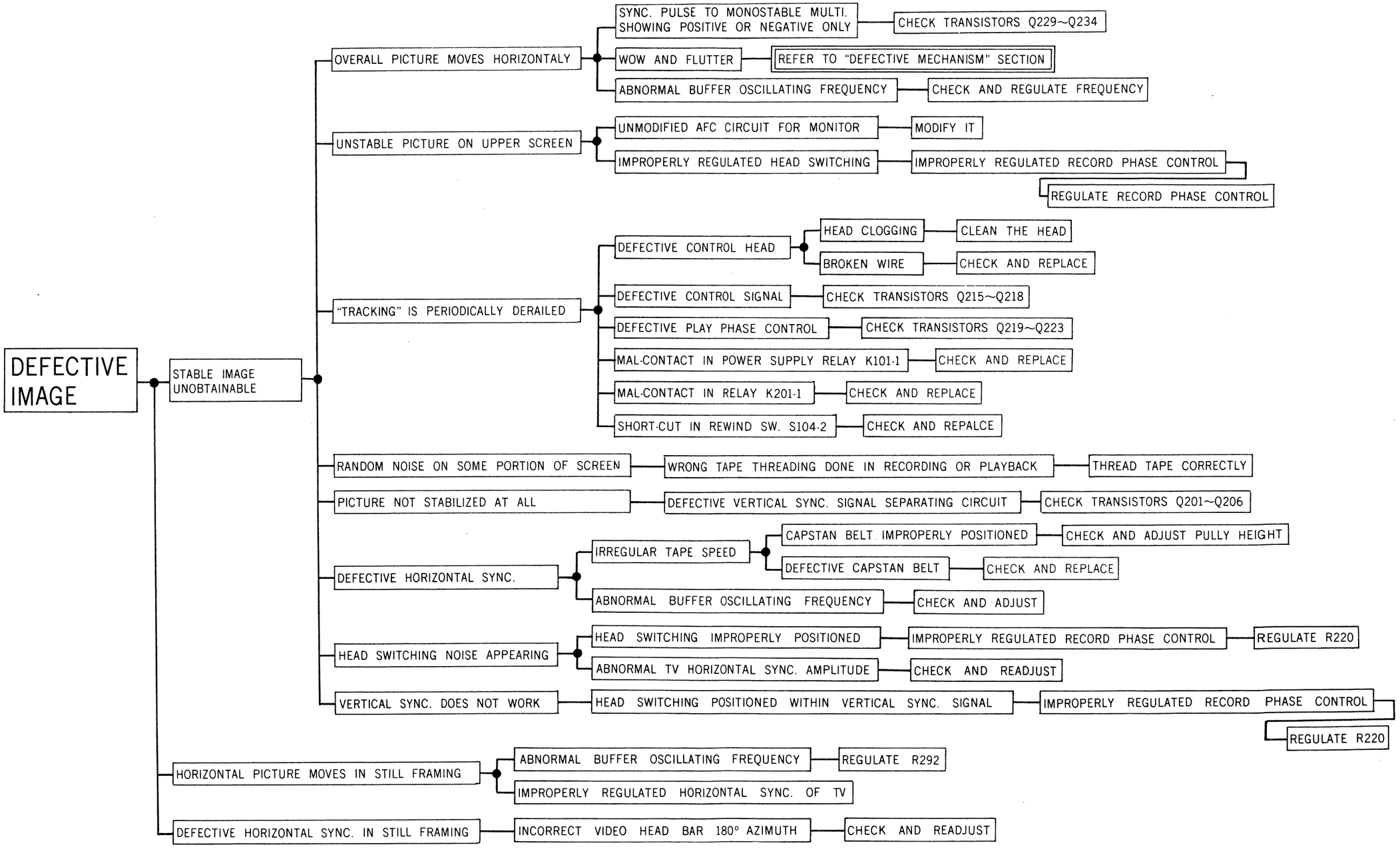
CLEAR PICTURE UNOBTAINABLE:



TROUBLE SHOOTERS' GUIDE : 3

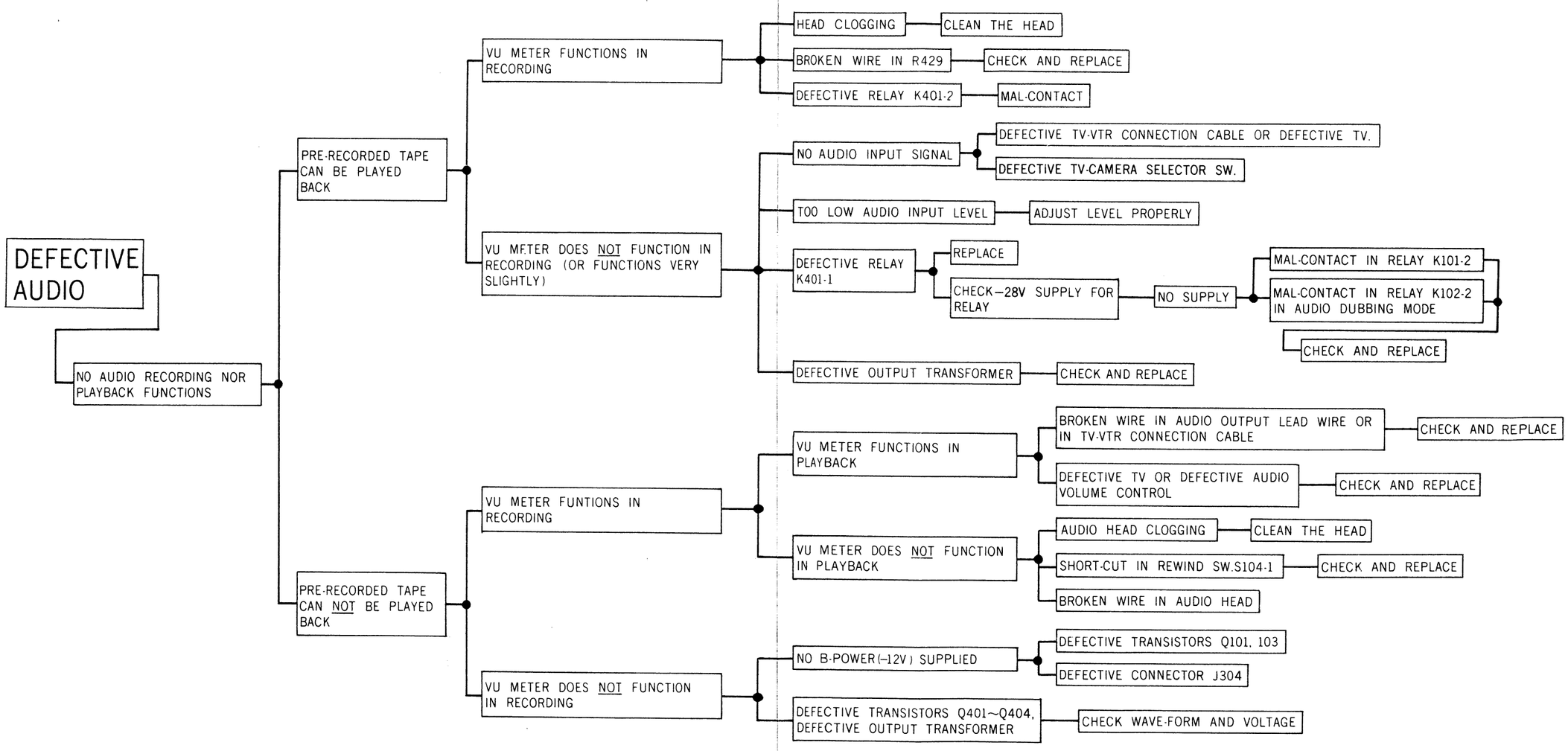
DEFECTIVE "VIDEO":

STABLE IMAGE UNOBTAINABLE:


DEFECTIVE IMAGE
STABLE IMAGE UNOBTAINABLE
OVERALL PICTURE MOVES HORIZONTALY
SYNC. PULSE TO MONOSTABLE MULTI. SHOWING POSITIVE OR NEGATIVE ONLY
CHECK TRANSISTORS Q229~Q234
WOW AND FLUTTER
REFER TO "DEFECTIVE MECHANISM" SECTION
ABNORMAL BUFFER OSCILLATING FREQUENCY
CHECK AND REGULATE FREQUENCY
UNSTABLE PICTURE ON UPPER SCREEN
UNMODIFIED AFC CIRCUIT FOR MONITOR
MODIFY IT
IMPROPERLY REGULATED HEAD SWITCHING
IMPROPERLY REGULATED RECORD PHASE CONTROL
REGULATE RECORD PHASE CONTROL
"TRACKING" IS PERIODICALLY DERAILED
DEFECTIVE CONTROL HEAD
HEAD CLOGGING
CLEAN THE HEAD
BROKEN WIRE
CHECK AND REPLACE
DEFECTIVE CONTROL SIGNAL
CHECK TRANSISTORS Q215~Q218
DEFECTIVE PLAY PHASE CONTROL
CHECK TRANSISTORS Q219~Q223
MAL-CONTACT IN POWER SUPPLY RELAY K101-1
CHECK AND REPLACE
MAL-CONTACT IN RELAY K201-1
CHECK AND REPLACE
SHORT-CUT IN REWIND SW. S104-2
CHECK AND REPALCE
RANDOM NOISE ON SOME PORTION OF SCREEN
WRONG TAPE THREADING DONE IN RECORDING OR PLAYBACK
THREAD TAPE CORRECTLY
PICTURE NOT STABILIZED AT ALL
DEFECTIVE VERTICAL SYNC. SIGNAL SEPARATING CIRCUIT
CHECK TRANSISTORS Q201~Q206
DEFECTIVE HORIZONTAL SYNC.
IRREGULAR TAPE SPEED
CAPSTAN BELT IMPROPERLY POSITIONED
CHECK AND ADJUST PULLY HEIGHT
DEFECTIVE CAPSTAN BELT
CHECK AND REPLACE
ABNORMAL BUFFER OSCILLATING FREQUENCY
CHECK AND ADJUST
HEAD SWITCHING NOISE APPEARING
HEAD SWITCHING IMPROPERLY POSITIONED
IMPROPERLY REGULATED RECORD PHASE CONTROL
REGULATE R220
ABNORMAL TV HORIZONTAL SYNC. AMPLITUDE
CHECK AND READJUST
VERTICAL SYNC. DOES NOT WORK
HEAD SWITCHING POSITIONED WITHIN VERTICAL SYNC. SIGNAL
IMPROPERLY REGULATED RECORD PHASE CONTROL
REGULATE R220
HORIZONTAL PICTURE MOVES IN STILL FRAMING
ABNORMAL BUFFER OSCILLATING FREQUENCY
REGULATE R292
IMPROPERLY REGULATED HORIZONTAL SYNC. OF TV
DEFECTIVE HORIZONTAL SYNC. IN STILL FRAMING
INCORRECT VIDEO HEAD BAR 180° AZIMUTH
CHECK AND READJUST

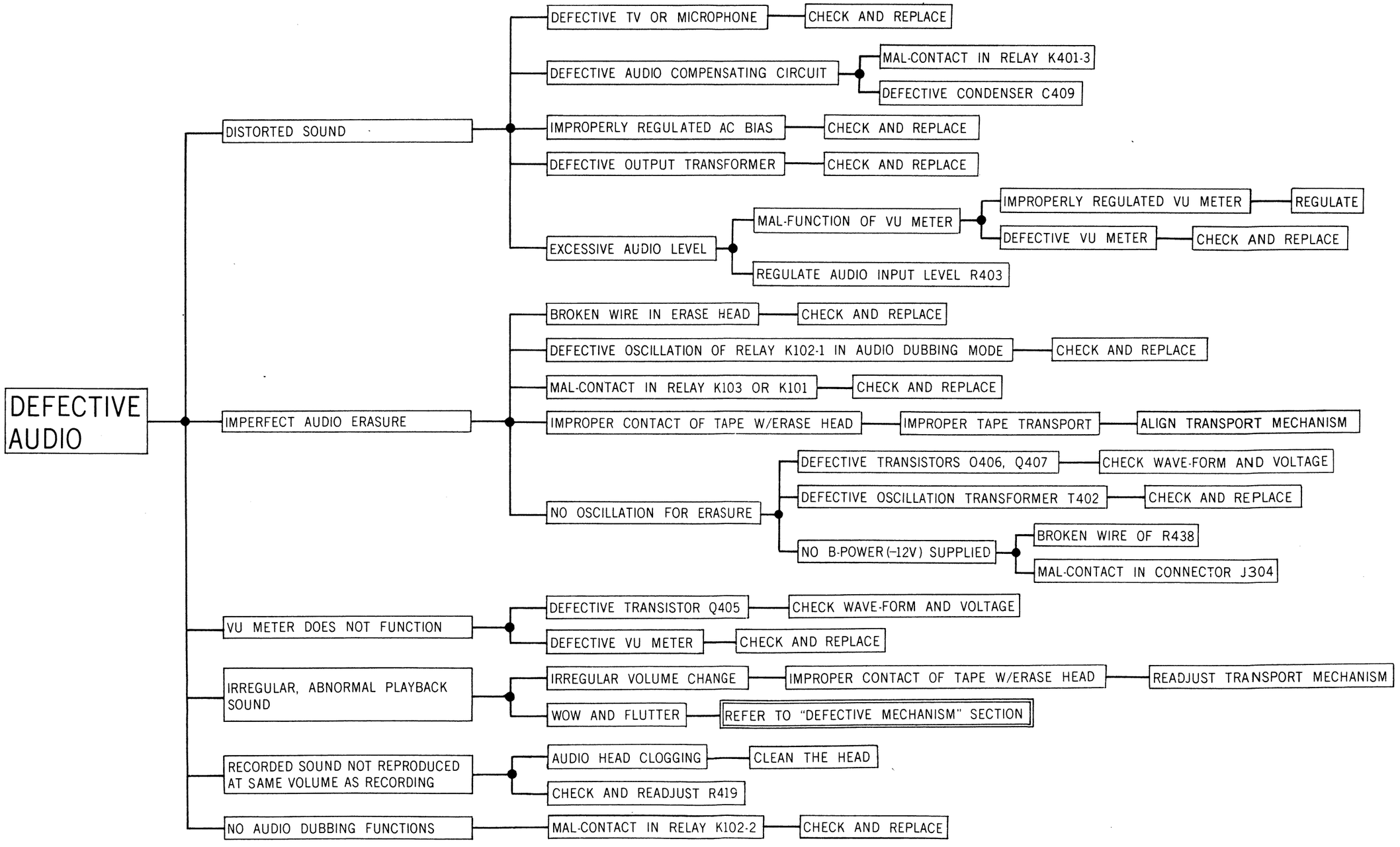
TROUBLE SHOOTERS' GUIDE: 4

DEFECTIVE "AUDIO":
NO RECORDING NOR PLAYBACK:


DEFECTIVE AUDIO
NO AUDIO RECORDING NOR PLAYBACK FUNCTIONS
PRE-RECORDED TAPE CAN BE PLAYED BACK
VU METER FUNCTIONS IN RECORDING
HEAD CLOGGING
CLEAN THE HEAD
BROKEN WIRE IN R429
CHECK AND REPLACE
DEFECTIVE RELAY K401-2
MAL-CONTACT
VU METER DOES NOT FUNCTION IN RECORDING (OR FUNCTIONS VERY SLIGHTLY)
NO AUDIO INPUT SIGNAL
DEFECTIVE TV-VTR CONNECTION CABLE OR DEFECTIVE TV.
DEFECTIVE TV-CAMERA SELECTOR SW.
TOO LOW AUDIO INPUT LEVEL
ADJUST LEVEL PROPERLY
DEFECTIVE RELAY K401-1
REPLACE
CHECK—28V SUPPLY FOR RELAY
NO SUPPLY
MAL-CONTACT IN RELAY K101-2
MAL-CONTACT IN RELAY K102-2 IN AUDIO DUBBING MODE
CHECK AND REPLACE
DEFECTIVE OUTPUT TRANSFORMER
CHECK AND REPLACE
PRE-RECORDED TAPE CAN NOT BE PLAYED BACK
VU METER FUNTIONS IN RECORDING
VU METER FUNCTIONS IN PLAYBACK
BROKEN WIRE IN AUDIO OUTPUT LEAD WIRE OR IN TV-VTR CONNECTION CABLE
CHECK AND REPLACE
DEFECTIVE TV OR DEFECTIVE AUDIO VOLUME CONTROL
CHECK AND REPLACE
VU METER DOES NOT FUNCTION IN PLAYBACK
AUDIO HEAD CLOGGING
CLEAN THE HEAD
SHORT-CUT IN REWIND SW.S104-1
CHECK AND REPLACE
BROKEN WIRE IN AUDIO HEAD
VU METER DOES NOT FUNCTION IN RECORDING
NO B-POWER(-12V) SUPPLIED
DEFECTIVE TRANSISTORS Q101, 103
DEFECTIVE CONNECTOR J304
DEFECTIVE TRANSISTORS Q401~Q404, DEFECTIVE OUTPUT TRANSFORMER
CHECK WAVE-FORM AND VOLTAGE

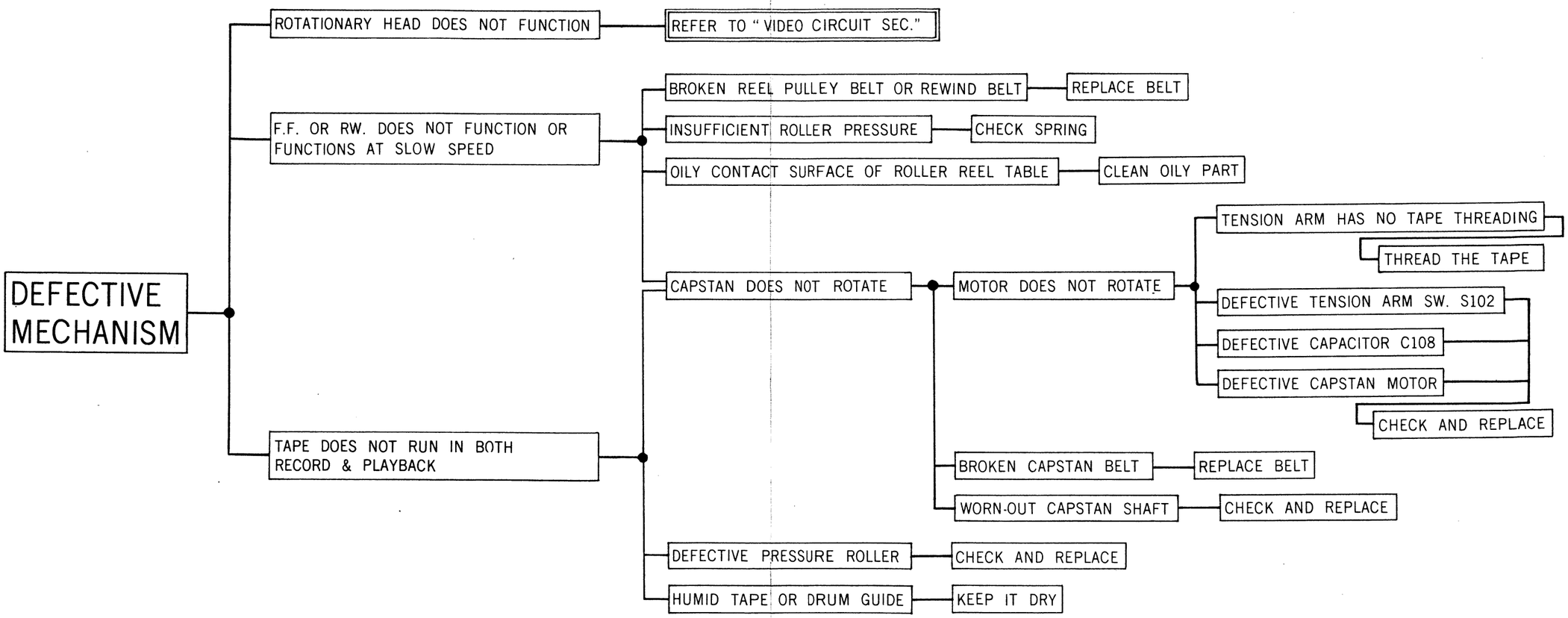
TROUBLE SHOOTERS' GUIDE : 5

DEFECTIVE "AUDIO":



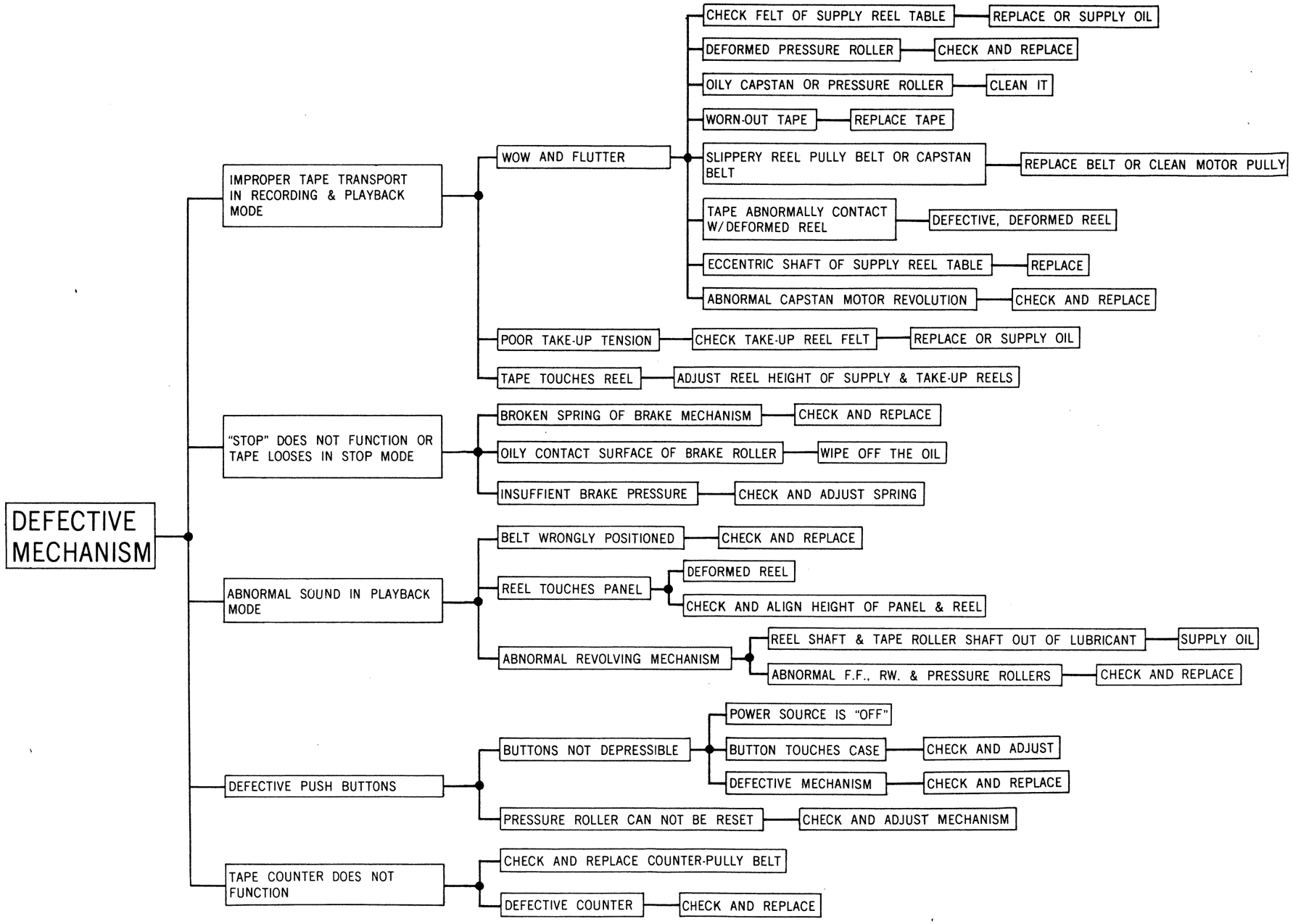
TROUBLE SHOOTERS' GUIDE : 6

DEFECTIVE **"MECHANISM"**:


DEFECTIVE MECHANISM
ROTATIONARY HEAD DOES NOT FUNCTION
REFER TO " VIDEO CIRCUIT SEC."
F.F. OR RW. DOES NOT FUNCTION OR FUNCTIONS AT SLOW SPEED
BROKEN REEL PULLEY BELT OR REWIND BELT
REPLACE BELT
INSUFFICIENT ROLLER PRESSURE
CHECK SPRING
OILY CONTACT SURFACE OF ROLLER REEL TABLE
CLEAN OILY PART
TAPE DOES NOT RUN IN BOTH RECORD & PLAYBACK
CAPSTAN DOES NOT ROTATE
MOTOR DOES NOT ROTATE
TENSION ARM HAS NO TAPE THREADING
THREAD THE TAPE
DEFECTIVE TENSION ARM SW. S102
DEFECTIVE CAPACITOR C108
DEFECTIVE CAPSTAN MOTOR
CHECK AND REPLACE
BROKEN CAPSTAN BELT
REPLACE BELT
WORN-OUT CAPSTAN SHAFT
CHECK AND REPLACE
DEFECTIVE PRESSURE ROLLER
CHECK AND REPLACE
HUMID TAPE OR DRUM GUIDE
KEEP IT DRY

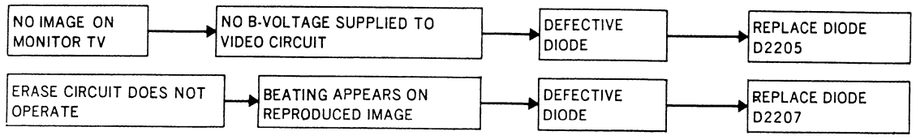
TROUBLE SHOOTERS' GUIDE : 7

DEFECTIVE "MECHANISM":


DEFECTIVE MECHANISM
IMPROPER TAPE TRANSPORT IN RECORDING & PLAYBACK MODE
WOW AND FLUTTER
CHECK FELT OF SUPPLY REEL TABLE
REPLACE OR SUPPLY OIL
DEFORMED PRESSURE ROLLER
CHECK AND REPLACE
OILY CAPSTAN OR PRESSURE ROLLER
CLEAN IT
WORN-OUT TAPE
REPLACE TAPE
SLIPPERY REEL PULLY BELT OR CAPSTAN BELT
REPLACE BELT OR CLEAN MOTOR PULLY
TAPE ABNORMALLY CONTACT W/DEFORMED REEL
DEFECTIVE, DEFORMED REEL
ECCENTRIC SHAFT OF SUPPLY REEL TABLE
REPLACE
ABNORMAL CAPSTAN MOTOR REVOLUTION
CHECK AND REPLACE
POOR TAKE-UP TENSION
CHECK TAKE-UP REEL FELT
REPLACE OR SUPPLY OIL
TAPE TOUCHES REEL
ADJUST REEL HEIGHT OF SUPPLY & TAKE-UP REELS
"STOP" DOES NOT FUNCTION OR TAPE LOOSES IN STOP MODE
BROKEN SPRING OF BRAKE MECHANISM
CHECK AND REPLACE
OILY CONTACT SURFACE OF BRAKE ROLLER
WIPE OFF THE OIL
INSUFFIENT BRAKE PRESSURE
CHECK AND ADJUST SPRING
ABNORMAL SOUND IN PLAYBACK MODE
BELT WRONGLY POSITIONED
CHECK AND REPLACE
REEL TOUCHES PANEL
DEFORMED REEL
CHECK AND ALIGN HEIGHT OF PANEL & REEL
ABNORMAL REVOLVING MECHANISM
REEL SHAFT & TAPE ROLLER SHAFT OUT OF LUBRICANT
SUPPLY OIL
ABNORMAL F.F., RW. & PRESSURE ROLLERS
CHECK AND REPLACE
DEFECTIVE PUSH BUTTONS
BUTTONS NOT DEPRESSIBLE
POWER SOURCE IS "OFF"
BUTTON TOUCHES CASE
CHECK AND ADJUST
DEFECTIVE MECHANISM
CHECK AND REPLACE
PRESSURE ROLLER CAN NOT BE RESET
CHECK AND ADJUST MECHANISM
TAPE COUNTER DOES NOT FUNCTION
CHECK AND REPLACE COUNTER-PULLY BELT
DEFECTIVE COUNTER
CHECK AND REPLACE

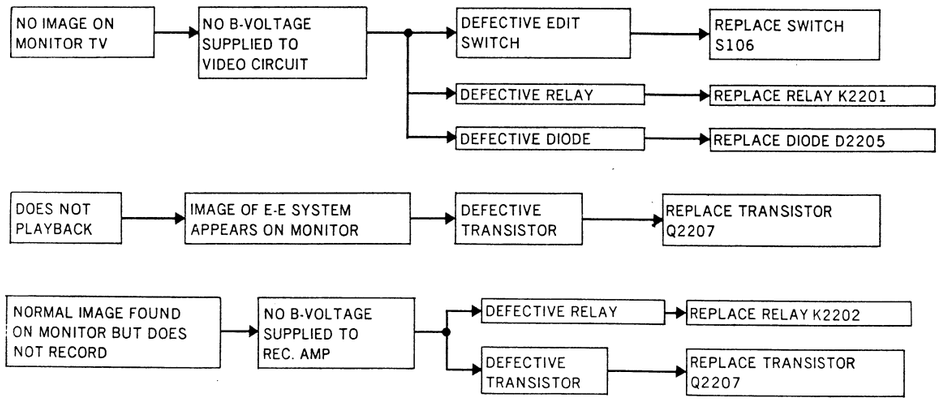
TROUBLE SHOOTERS' GUIDE: 8

1. When performing a normal recording:

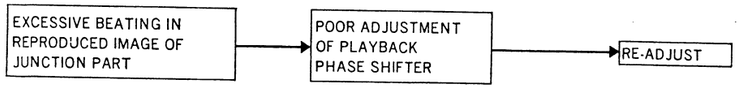


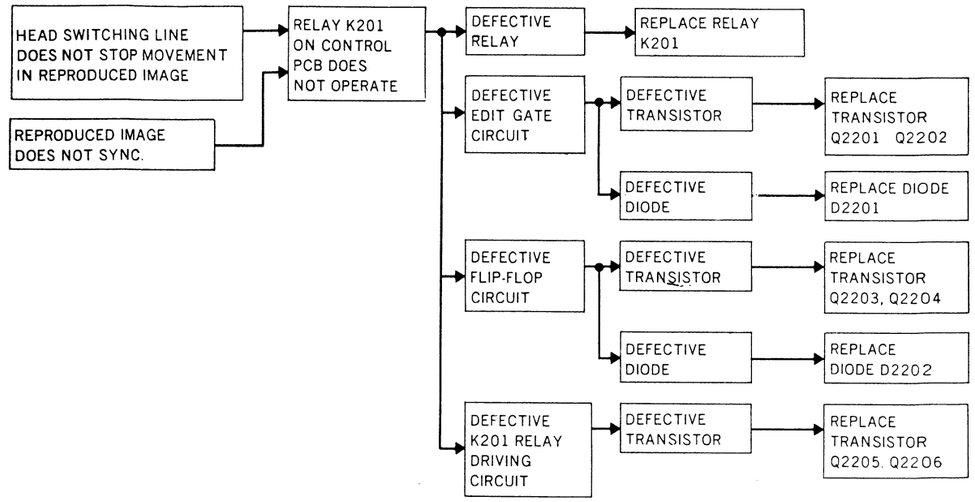
2. When performing an editing

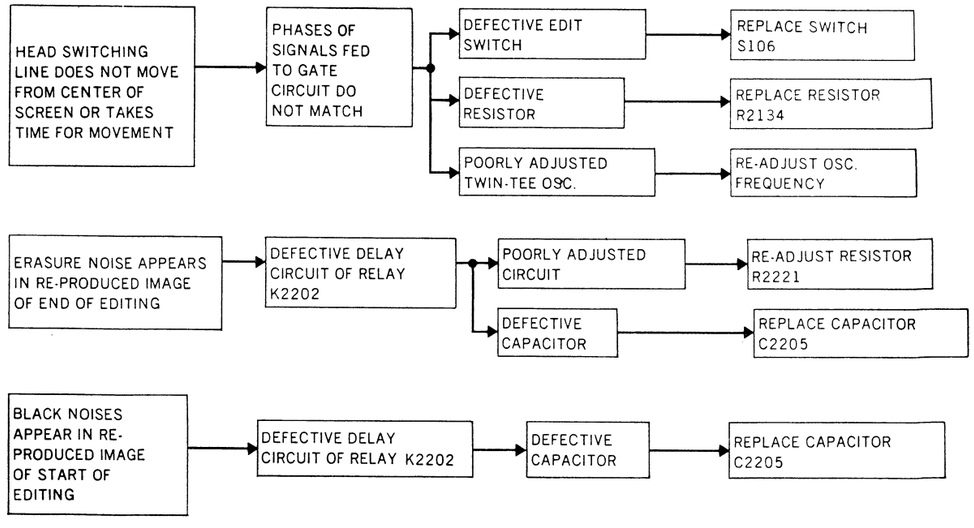
A. Relating to Video Circuit:



B. Relating to Control Circuit:






HEAD SWITCHING LINE DOES NOT MOVE FROM CENTER OF SCREEN OR TAKES TIME FOR MOVEMENT
PHASES OF SIGNALS FED TO GATE CIRCUIT DO NOT MATCH
DEFECTIVE EDIT SWITCH
REPLACE SWITCH S106
DEFECTIVE RESISTOR
REPLACE RESISTOR R2134
POORLY ADJUSTED TWIN-TEE OSC.
RE-ADJUST OSC. FREQUENCY
ERASURE NOISE APPEARS IN RE-PRODUCED IMAGE OF END OF EDITING
DEFECTIVE DELAY CIRCUIT OF RELAY K2202
POORLY ADJUSTED CIRCUIT
RE-ADJUST RESISTOR R2221
DEFECTIVE CAPACITOR
REPLACE CAPACITOR C2205
BLACK NOISES APPEAR IN RE-PRODUCED IMAGE OF START OF EDITING
DEFECTIVE DELAY CIRCUIT OF RELAY K2202
DEFECTIVE CAPACITOR
REPLACE CAPACITOR C2205

MECHANICAL PARTS LOCATION MODEL NV-1020, 1020E

SUPPLY REEL HUB—IMPROPER BACK TENSION and POOR REWIND

REWIND PULLEY—BELT AND REEL HUB DO NOT ROTATE and POOR REWIND due to Insufficient Pressure of Rewind Roller against Supply Reel Hub and Dirty Rewind Roller Surface.

TENSION ARM—INOPERATIVE due to Spring out of position.

ERASE HEAD—IMPROPER ERASURE due to poor Alignment

TAPERED POST

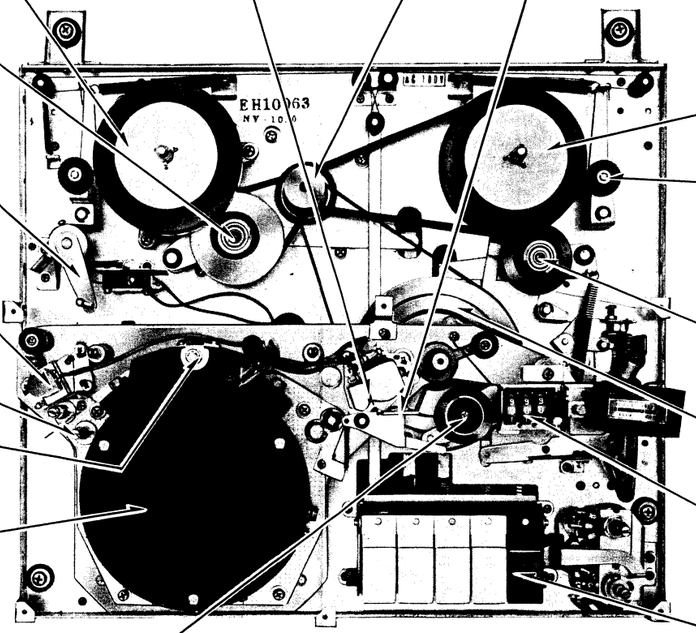
HEAD CLEANING DEVICE—IMPROPER HEAD CLEANING due to worn-out Brush.

ROTARY HEAD ASSEMBLY—NOISE due to worn-out Brush or Dirty Slip-Ring and worn-out Head

AUDIO/CONTROL HEAD—POOR RECORD/PLAYBACK or FAULTY SYNCHRONIZATION due to Dirty or Poorly Aligned Head.

MOTOR PULLEY—NO TAPE MOVEMENT due to loose Motor Pulley Holding Screw.

TAPE PRESSURE PAD—POOR RECORD OR PLAYBACK due to Insufficient Pad Pressure against Head.



TAKEUP REEL HUB—NOISE due to Improper Alignment of Hub, UNEVEN TAPE MOVEMENT due to Excessive Takeup Torque, LACK OF TAKEUP TENSION due to Poor Clutch Alignment, Poor REWINDING due to Excessive Back Tension to tape and NO TAKEUP due to lack of lubrication to shaft.

BRAKE-TAPE SLACK due to Improper Adjustment.

F. F. ROLLER—POOR F. F. due to Improper F. F. Roller Pressure against Takeup Reel Hub or Oily or Dirty F. F. Roller surface.

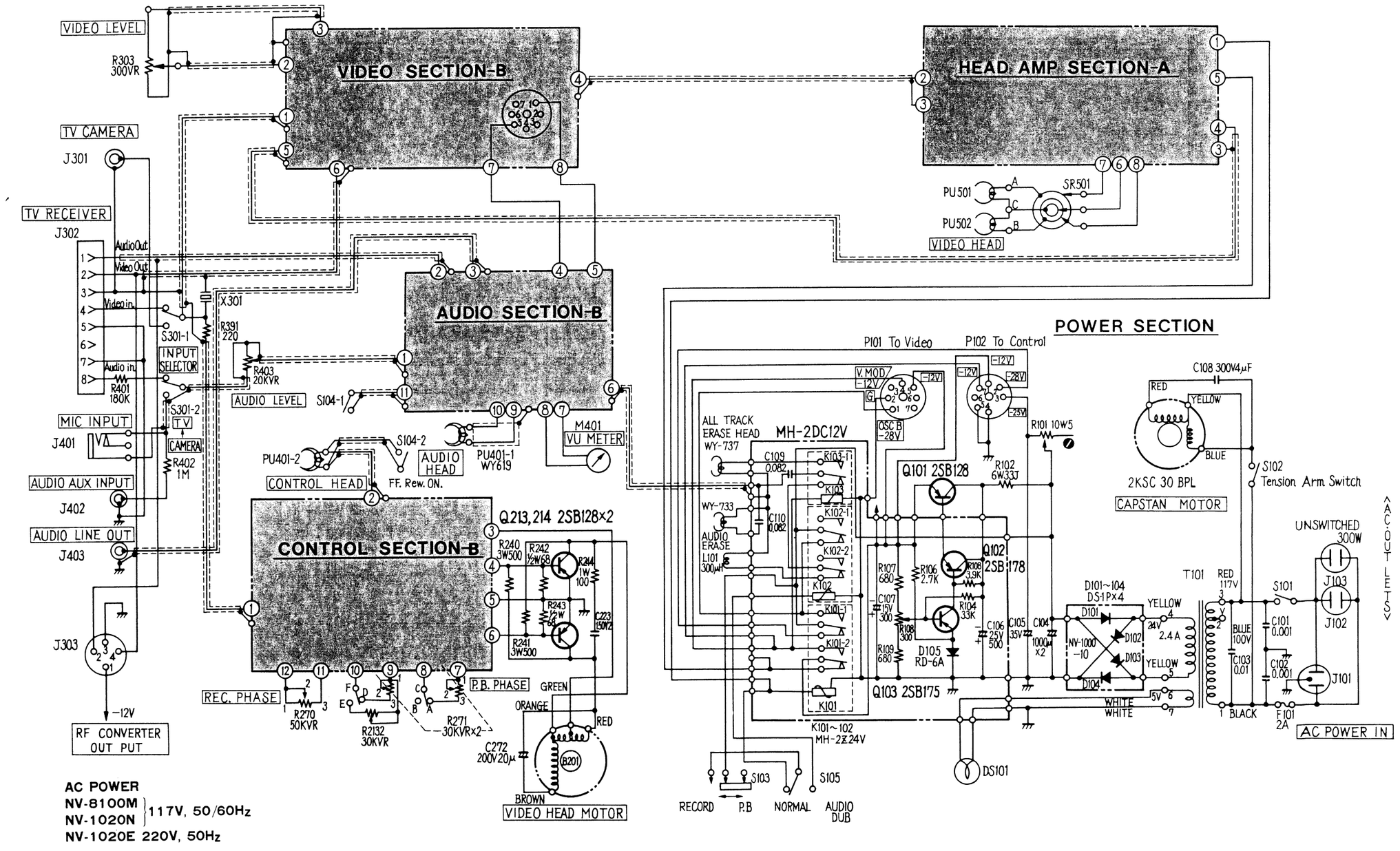
FLY WHEEL

TAPE COUNTER

PUSH BUTTONS

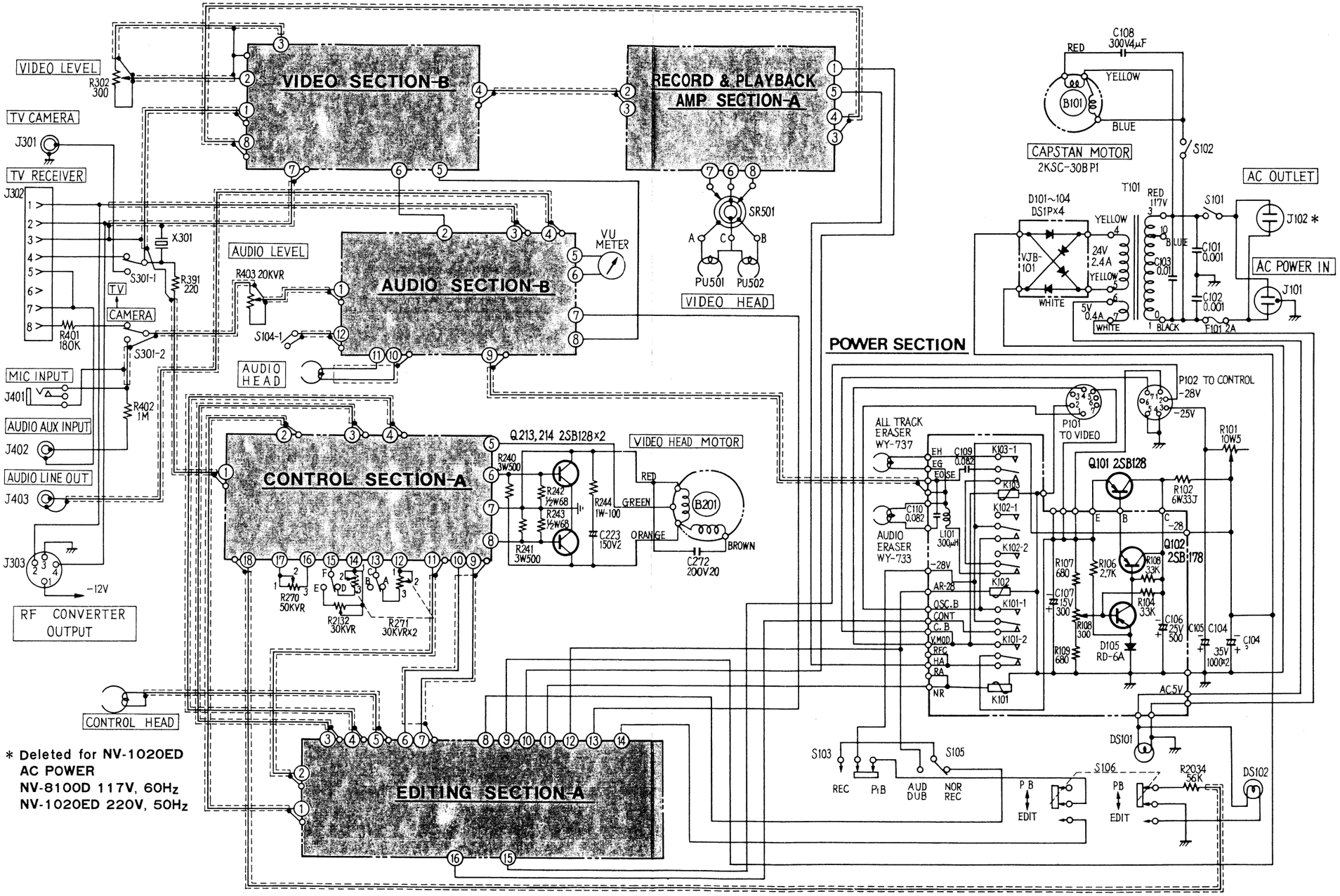
PRESSURE ROLLER—UNEVEN TAPE MOVEMENT due to Improper Pressure Roller Alignment or Pressure against Capstan

CONNECTION DIAGRAM MODEL: NV-8100M NV-1020N/E



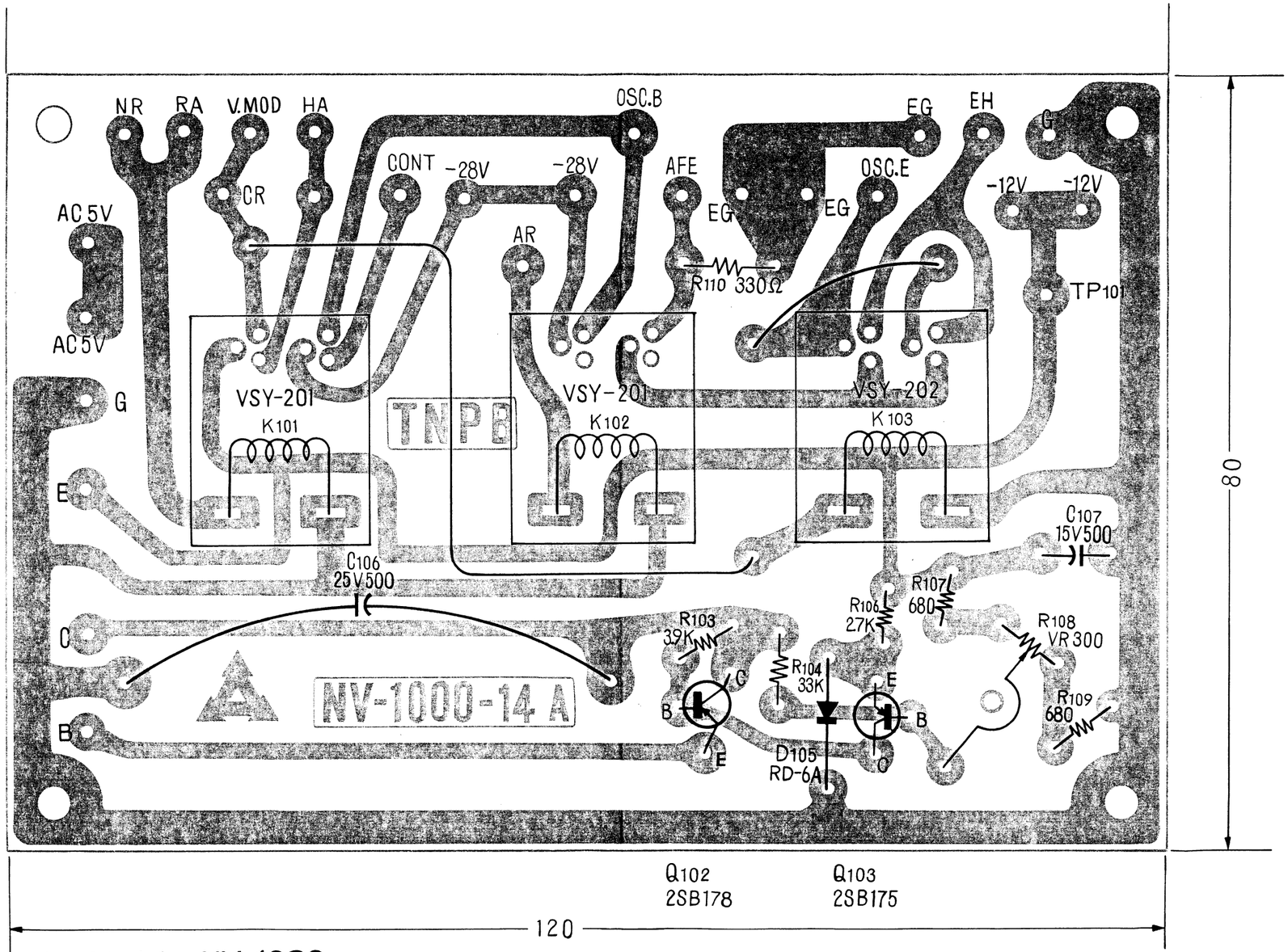
AC POWER
NV-8100M } **117V, 50/60Hz**
NV-1020N
NV-1020E 220V, 50Hz

CONNECTION DIAGRAM MODEL: NV-8100D NV-1020ED



* Deleted for **NV-1020ED**
AC POWER
NV-8100D 117V, 60Hz
NV-1020ED 220V, 50Hz

POWER SECTION
VEP-101AK & VEP-101EK

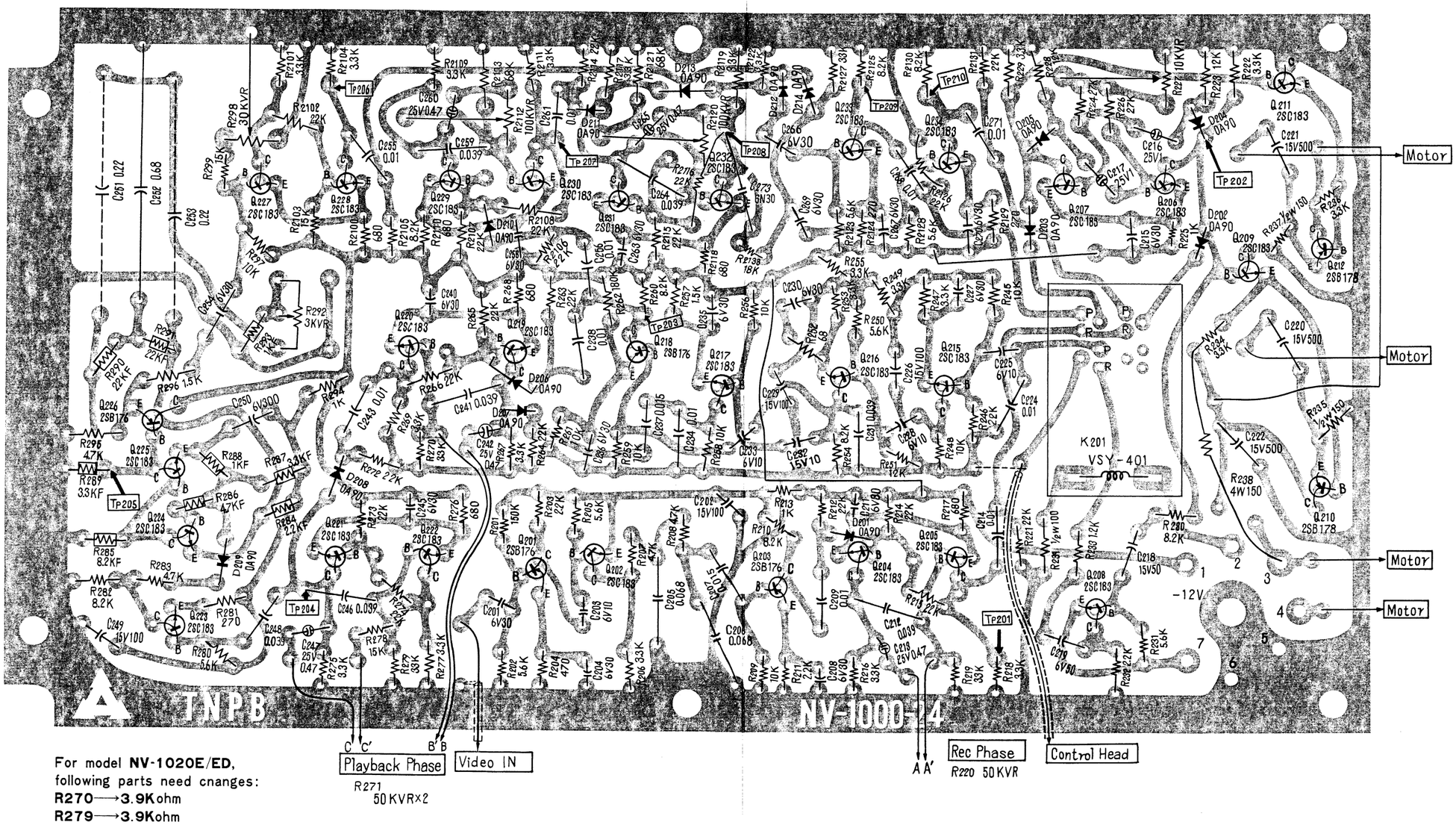


For Model: NV-1020
NV-1020E

POWER SUPPLY CIRCUIT

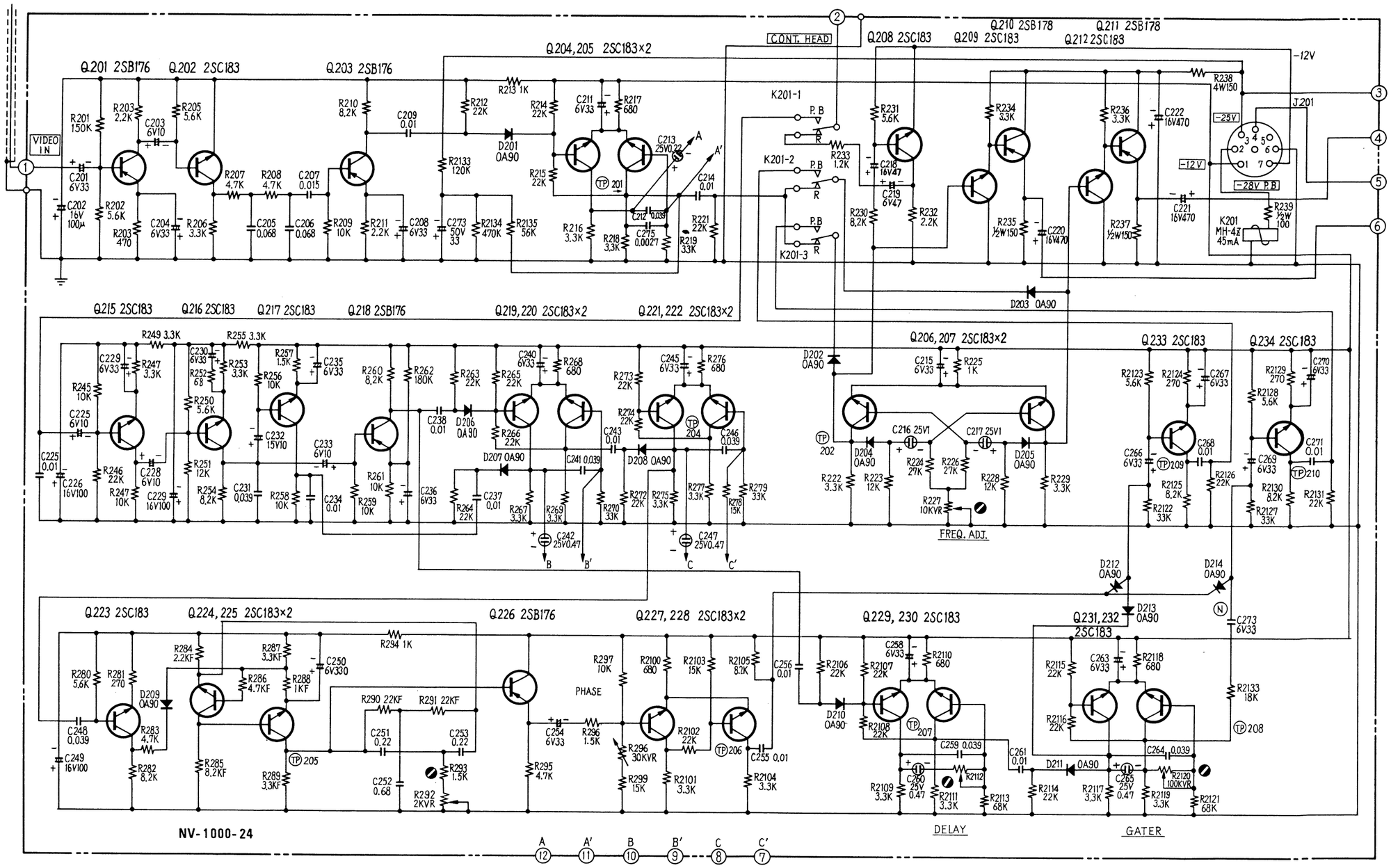
CONTROL SECTION-A

For model **NV-1020N/D**

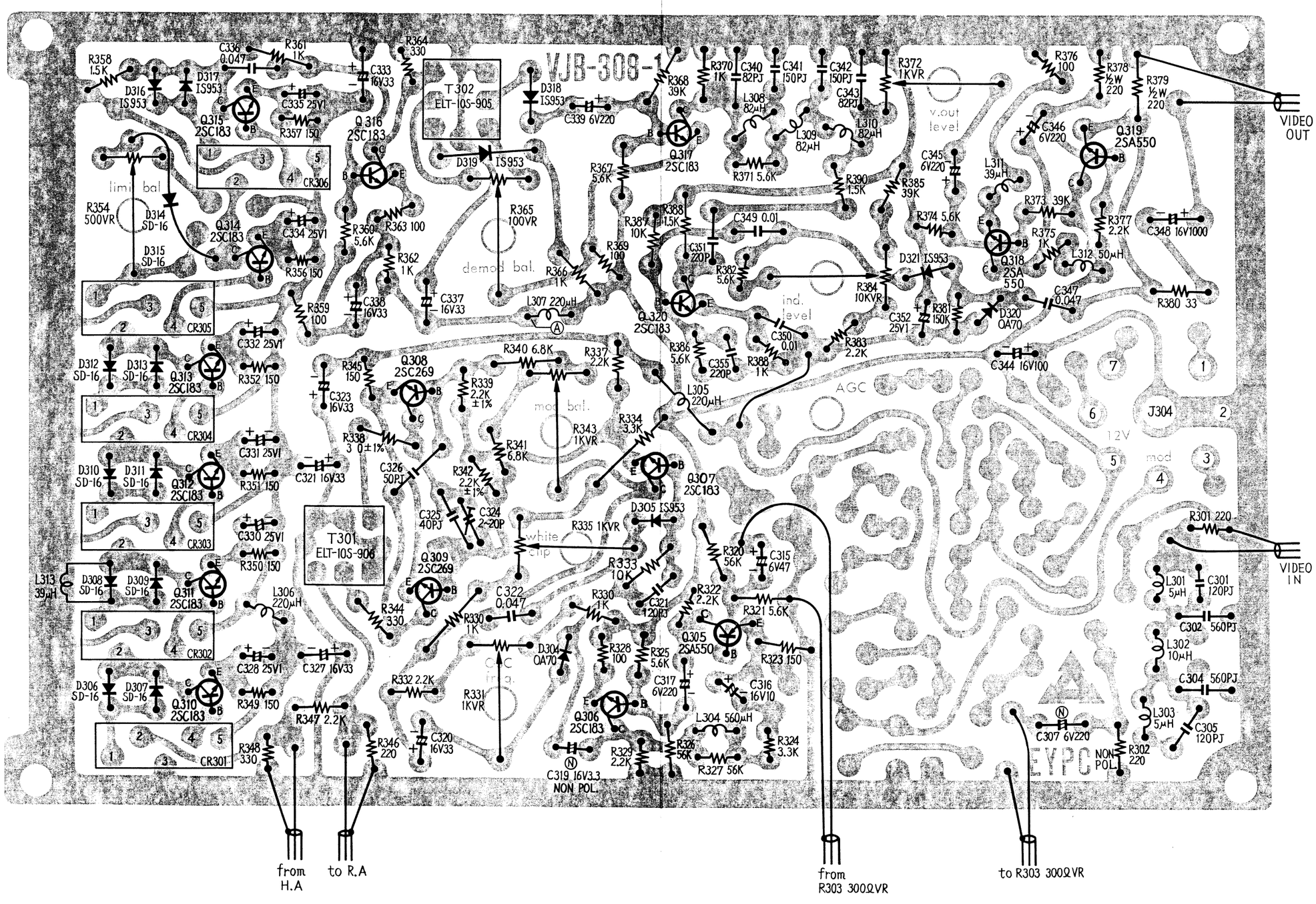


For model **NV-1020E/ED**,
following parts need cnanges:
R270⟶3.9Kohm
R279⟶3.9Kohm
C252⟶1.0 F

CONTROL SECTION-A MODEL NV-1020E/ED NV-1020N/D NV-1020A NV-8100M/D

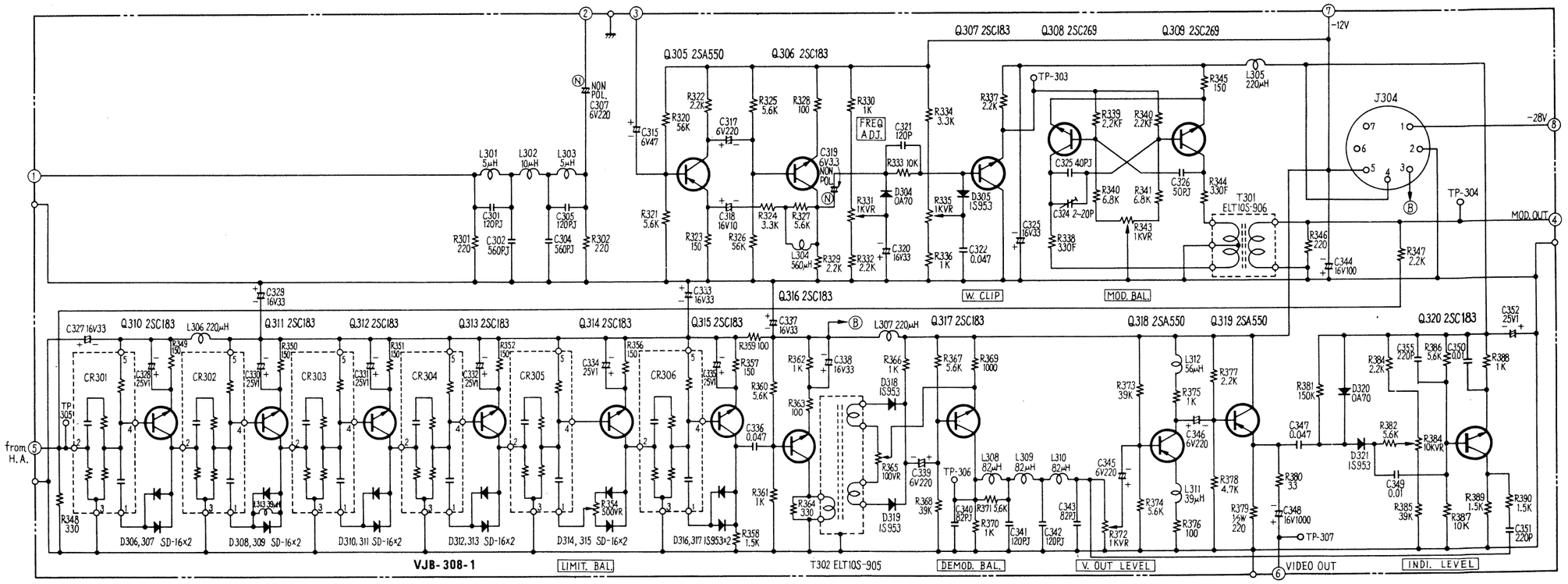


VIDEO SECTION-B MODEL: NV-1020E/NV-1020N

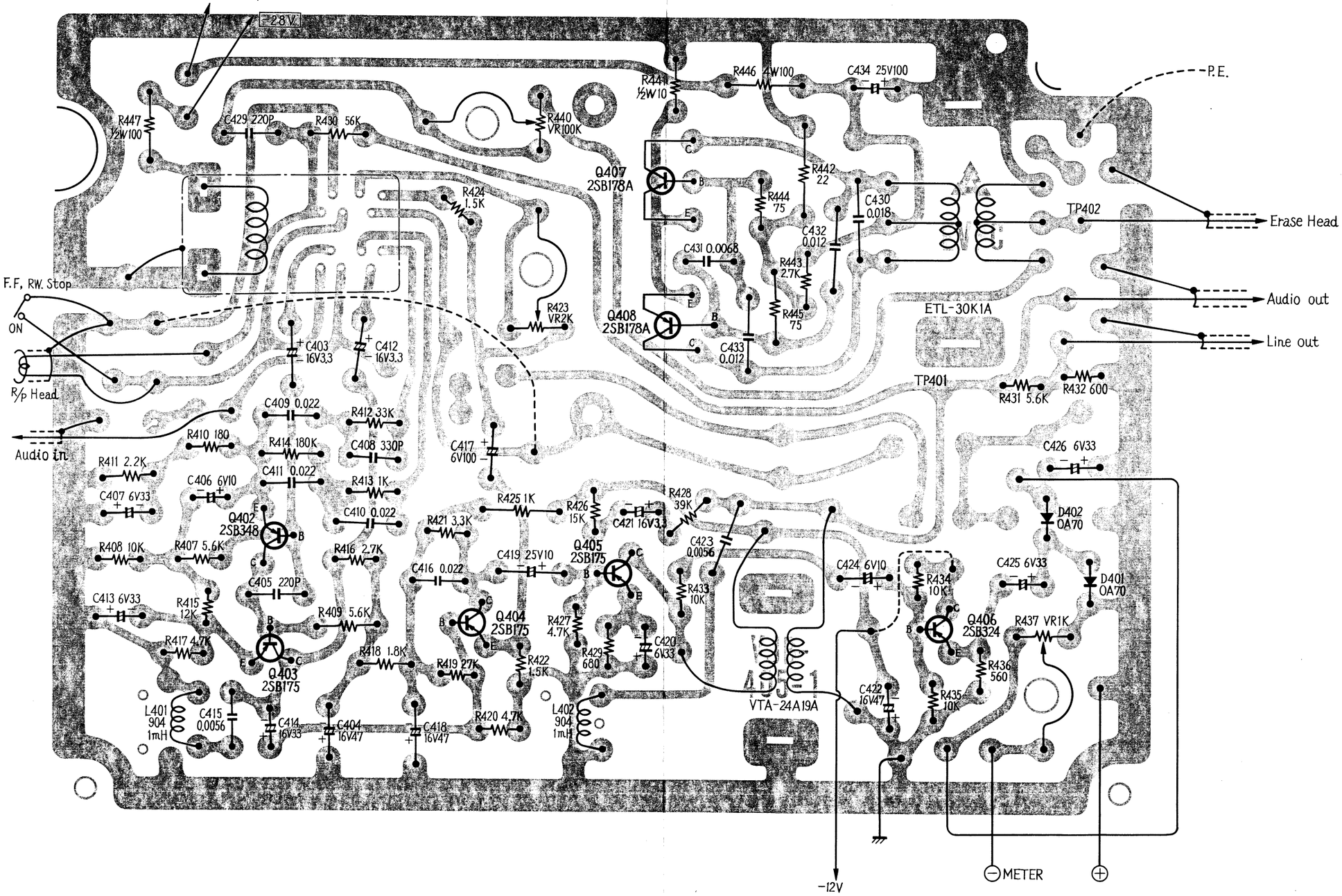


VIDEO SECTION-B

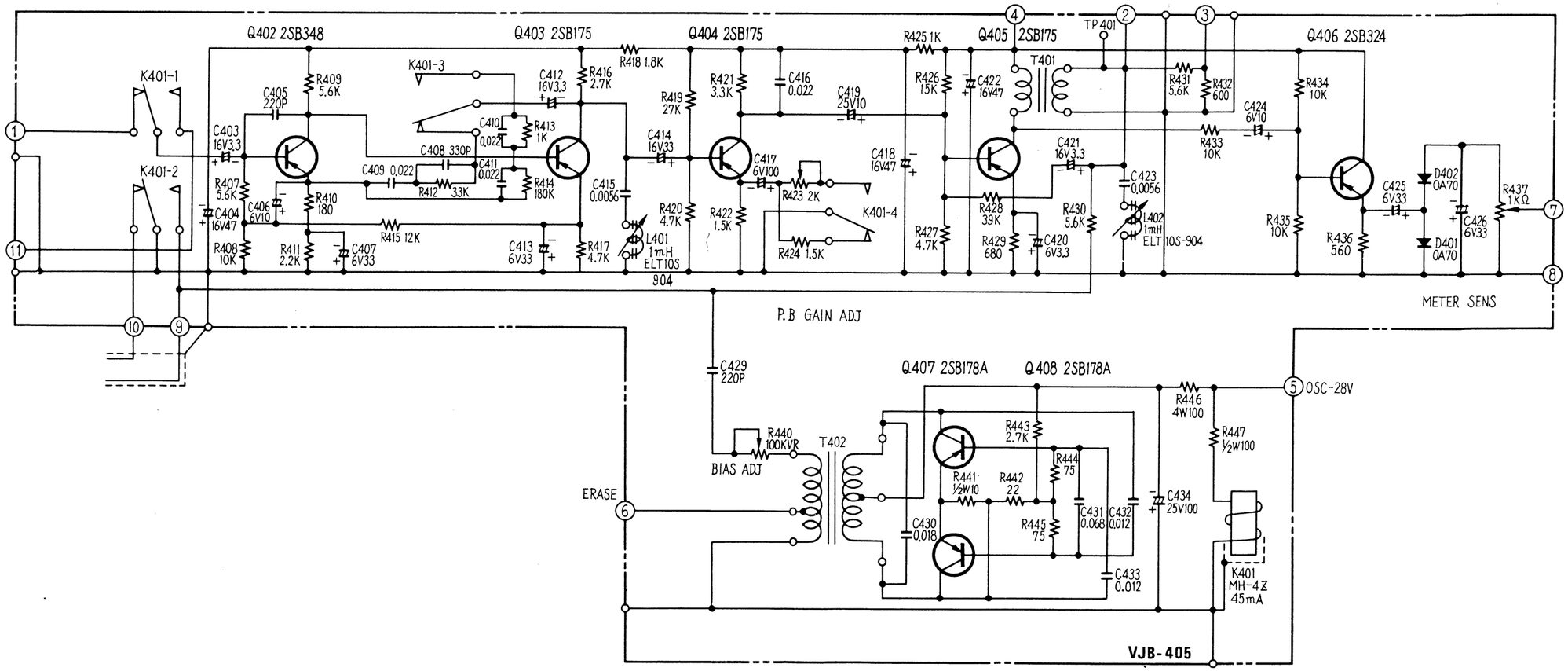
MODEL: NV-1020E/ED
NV-1020N/D
NV-1020A
NV-8100M/D



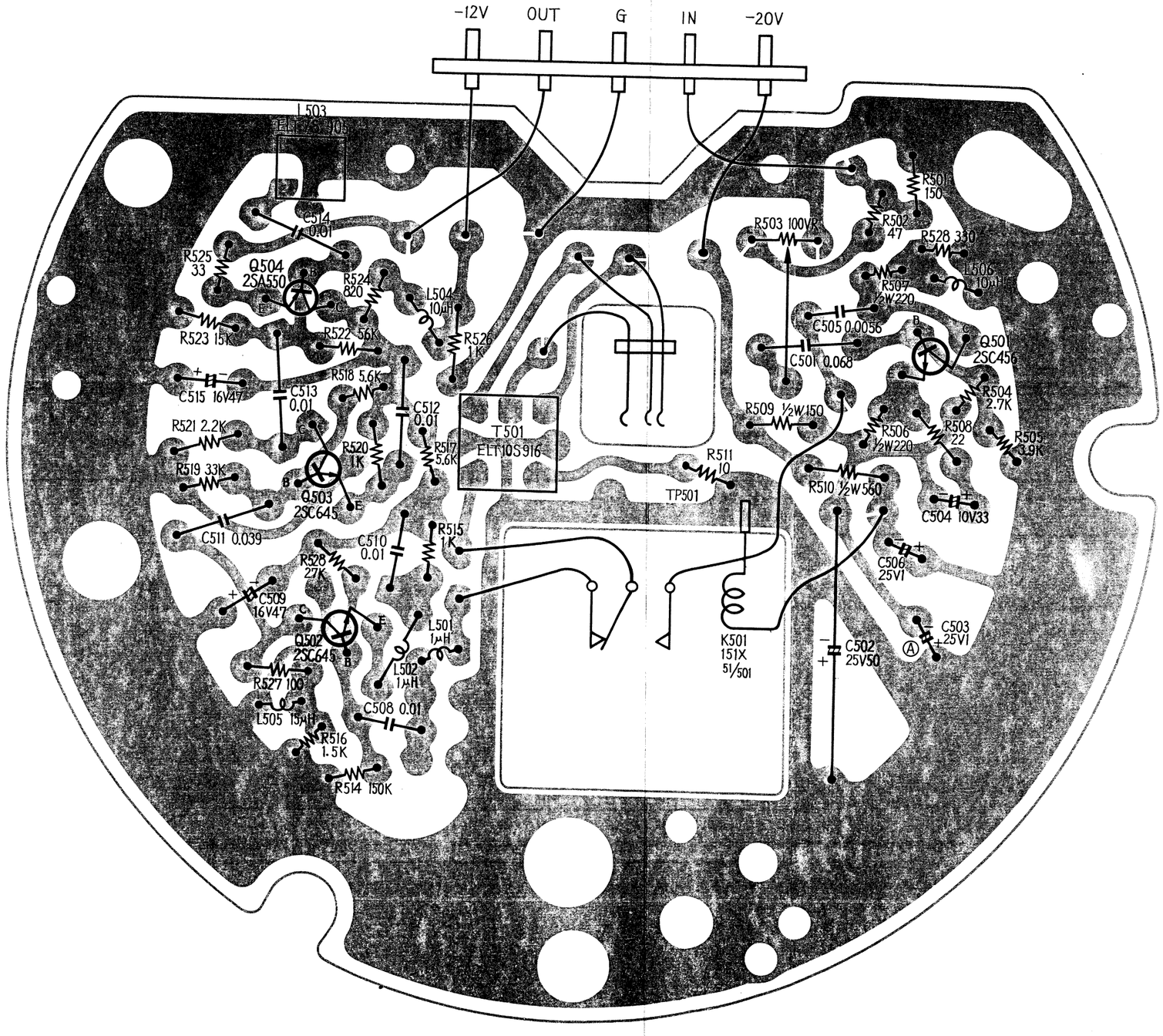
AUDIO SECTION-B MODEL: NV-1020E/ED
NV-1020N/D
NV-1020A
NV-8100M/D



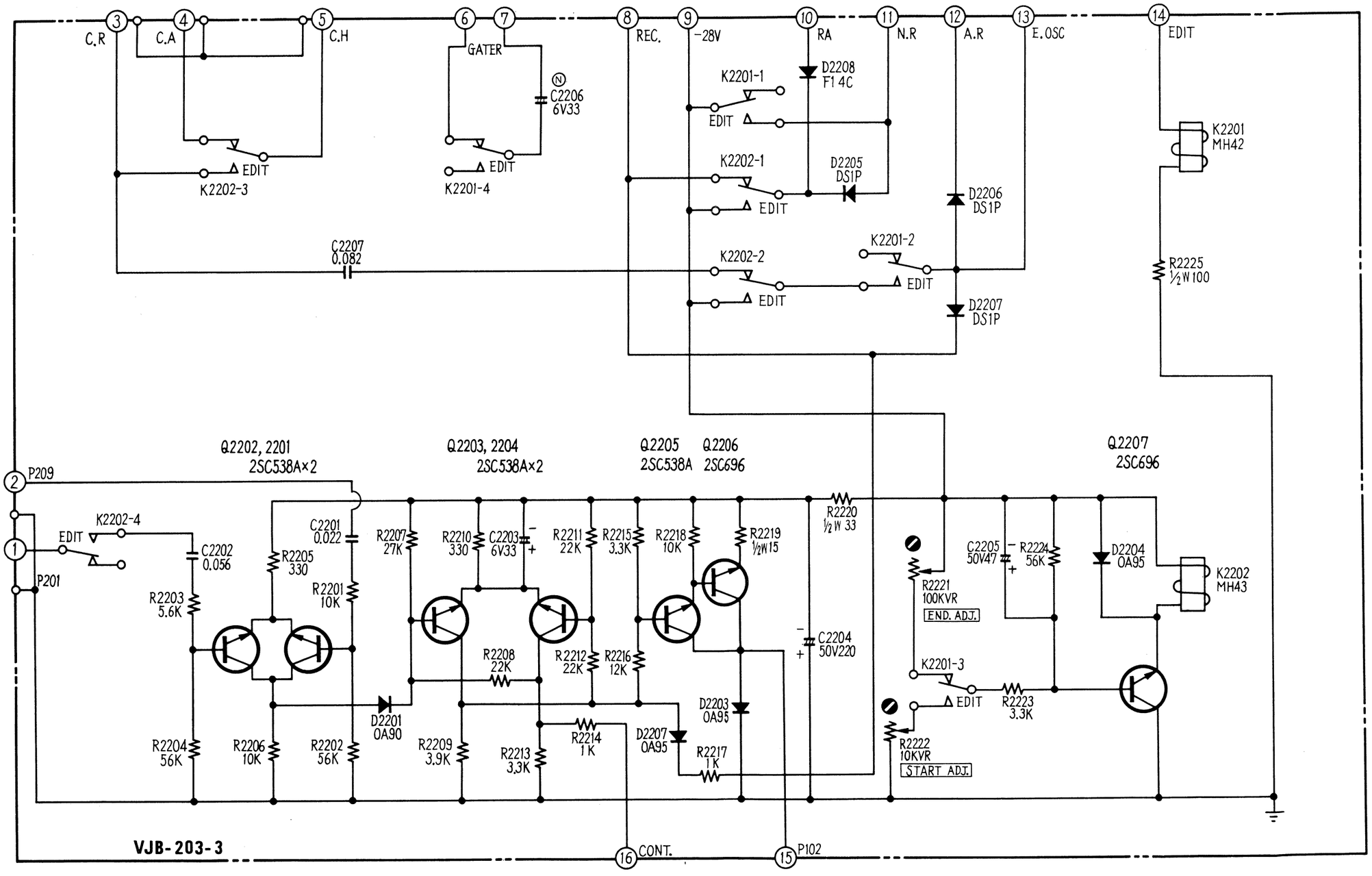
AUDIO SECTION-B MODEL NV-1020E/ED NV-1020N/D NV-8100M/D



R/PB AMPLIFIER MODEL: NV-1020E/ED
NV-1020N/ND
NV-1020A
NV-8100M/D



EDITING CIRCUIT-A



VIDEO TAPE RECORDER
MECHANICAL PARTS BREAKDOWN
MODEL NV-1020
MODEL NV-1020E

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I-5. MICRO SWITCH ASSEMBLY, Tape Auto-Stop 3
I-6. TENSION ARM ASSEMBLY 4

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II-1-1. TAPE GUIDE DRUM ASSEMBLY 7
II-1-2. TAPE SUPPORTER ASSEMBLY 8
II-1-4. HEAD CLEANER ASSEMBLY 9
II-1-5. SLIPRING BRUSH ASSEMBLY 10
II-2. FULL TRACK ERASE HEAD ASSEMBLY 11
II-3. AUDIO/CONTROL HEAD ASSEMBLY 11
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JACK PANEL ASSEMBLY 20
IV-5. CHASSIS ASSEMBLY 21

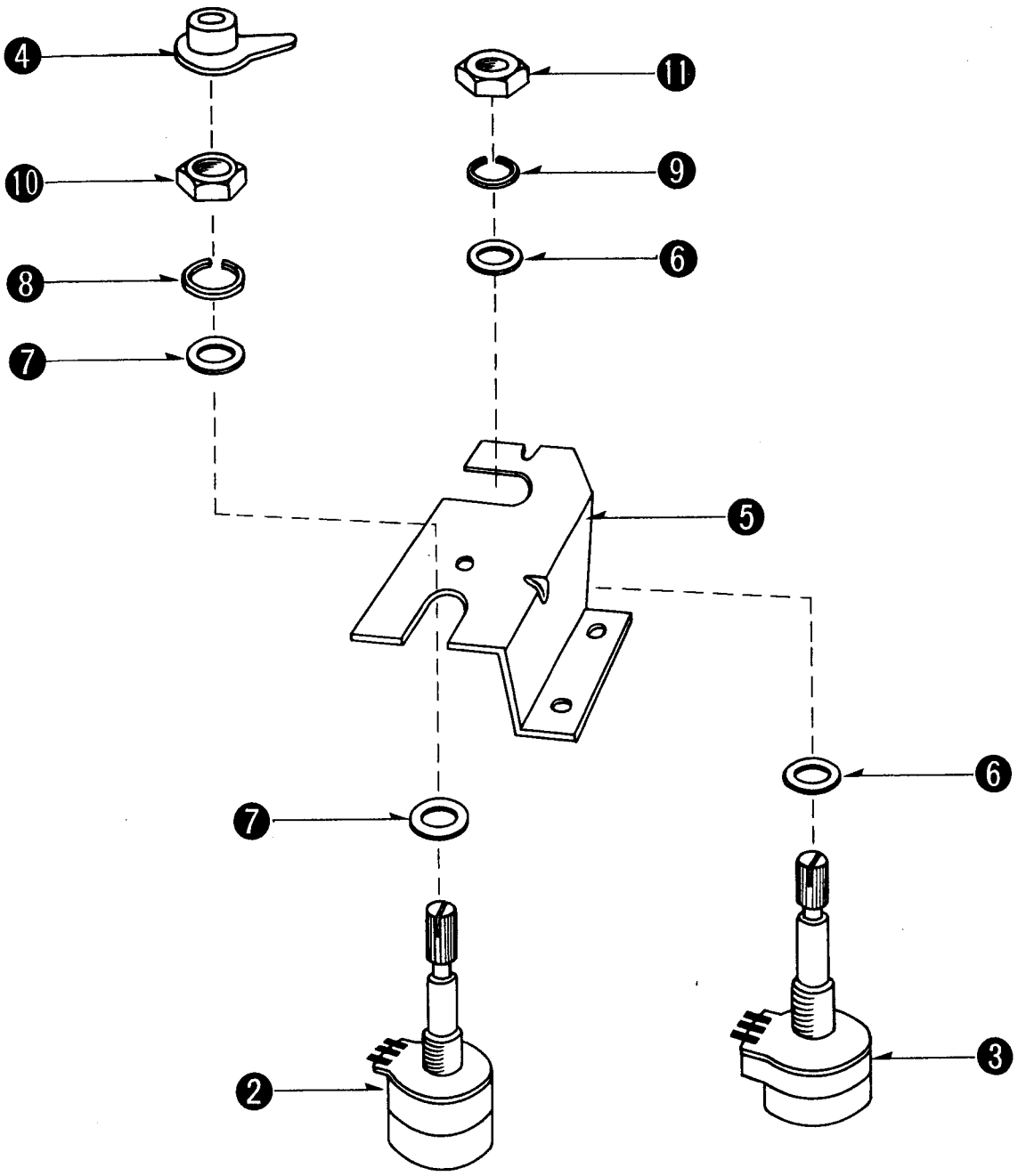
V. CASING ..... 22 thru 24

V-1. TOP PANEL ASSEMBLY 23
V-2. HEAD CAP ASSEMBLY 24

VI. PACKING 25

I. SYSTEM CONTROL PARTS BREAKDOWN

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
1	VXU-1-2	PUSH BUTTON Assembly	1	
2	VXA-18-2	LEVEL CONTROL Assembly	1	
3	VES-1	LEAF SWITCH Assembly, Rewind	1	
4	VXL-3	ARM, Pressure Roller	1	
5	VXA-29-1	MICRO SWITCH Assembly	1	
6	VXA-23-2	TENSION ARM Assembly	1	
7	VXA-3-1	STOPPER, Tension Arm	1	
8	VXB-1	SPRING ASSEMBLY, Pressure Roller	1	
9	VMB-26	SPRING, Tension arm	1	
10	VXL-8-1	LEVER Assembly, Record Switch	1	
11	VES-2	SLIDE SWITCH Assembly	1	
12	VMM-1	ROD, Pressure Roller	1	
13	VMB-11-1	SPRING, Record Switch Lever	1	
14	VXL-9	LEVER, Pressure Roller	1	
15	SW-3	SPRING WASHER, 3ϕ		
16	SW-4	SPRING WASHER, 4ϕ		
17	EW-3	RETAINING RING, 3ϕ		
18	EW-4	RETAINING RING, 4ϕ		
19	W-3Y	FLAT WASHER, 3ϕ		
20	VNT-3	FIBER WASHER, 3ϕ		
21	VNT-4	FIBER WASHER, 4ϕ		
22	VNT-5	FIBER WASHER, 5ϕ		
23	VNT-6	FIBER WASHER, 6ϕ		
24	P-P3-6FY	SMALL SCREW, Phillips, 3×6		
25	P-P3-8FY	SMALL SCREW, Phillips, 3×8		
26	P-P3-14FY	SMALL SCREW, Phillips, 3×14		
27	FN-4Y	HEX NUT, 4ϕ		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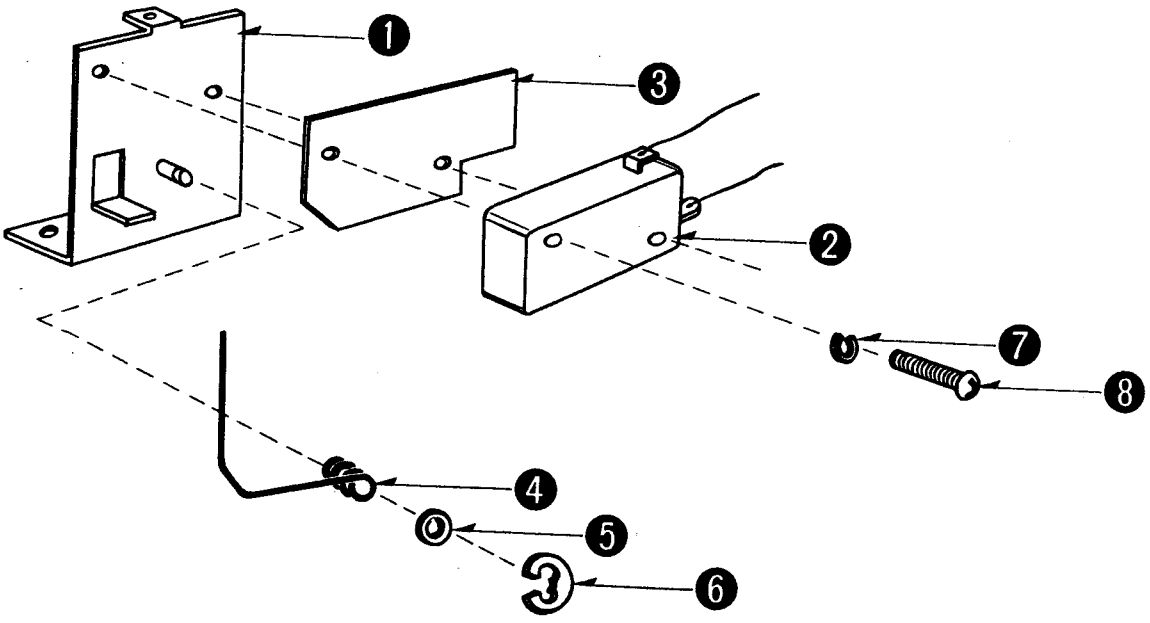
I-5. MICRO SWITCH Assembly, Tape Auto-Stop

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
I-5	VXA-29-1	MICRO SWITCH Assembly	1	
1	VXA-21-2	PLATE, Switch Holding	1	
2	QSMO015	MICRO SWITCH	1	
3	VMZ-1-2	COVER, Micro Switch	1	
4	VMB-27	FEELER, Micro Switch	1	
5	VNT-3	FIBER WASHER, 3ϕ		
6	EW-3	RETAINING RING, 3ϕ		
7	SW-2.6	SPRING WASHER, 2.6ϕ		
8	P-P2.6-16FY	SMALL SCREW, Phillips, 2.6×16		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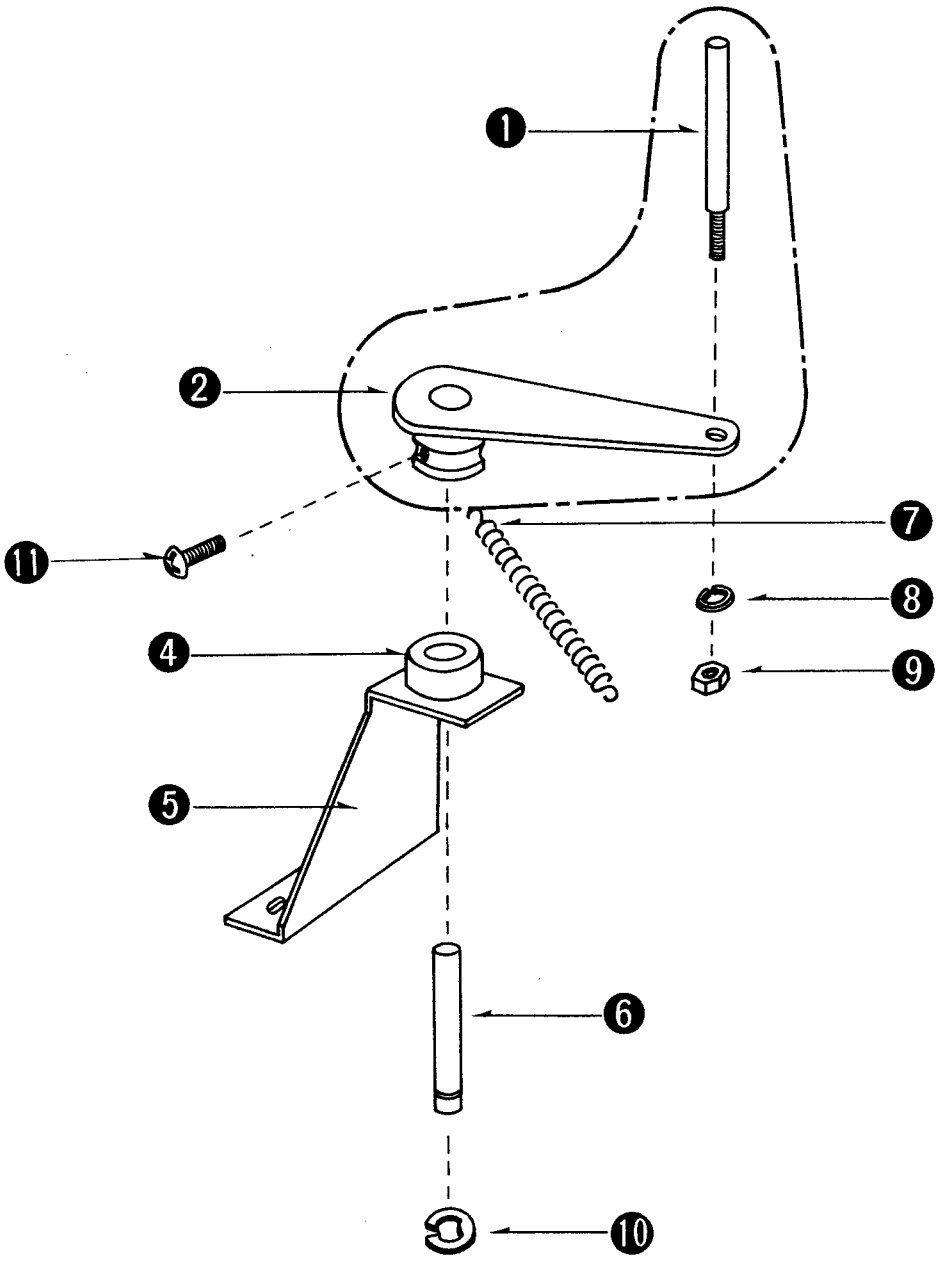
I-6. TENSION ARM Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
I-6	VXA-23-2	TENSION ARM Assembly	1	
1	VMS 23S 1	POST, Tension Arm	1	
2	VXL-7-1	LEVER, Tension Arm *	1	
4	VDB 34	THRUST, Tension Pulley	1	
5	VMA 90 1	ANGLE, Tension Arm	1	
6	VMS 57	SHAFT, Tension Arm	1	
7	VMB-26	SPRING, Tension Arm	1	
8	SW-3	SPRING WASHER, 3ϕ		
9	FN-3Y	HEX NUT, 3ϕ		
10	EW-4	RETAINING RING, 4ϕ		
11	P-P3-10FY	SMALL SCREW, Phillips, 3×10		

NOTE: Reference No. 3 is deleted.

*This part always supplied with VMS-23.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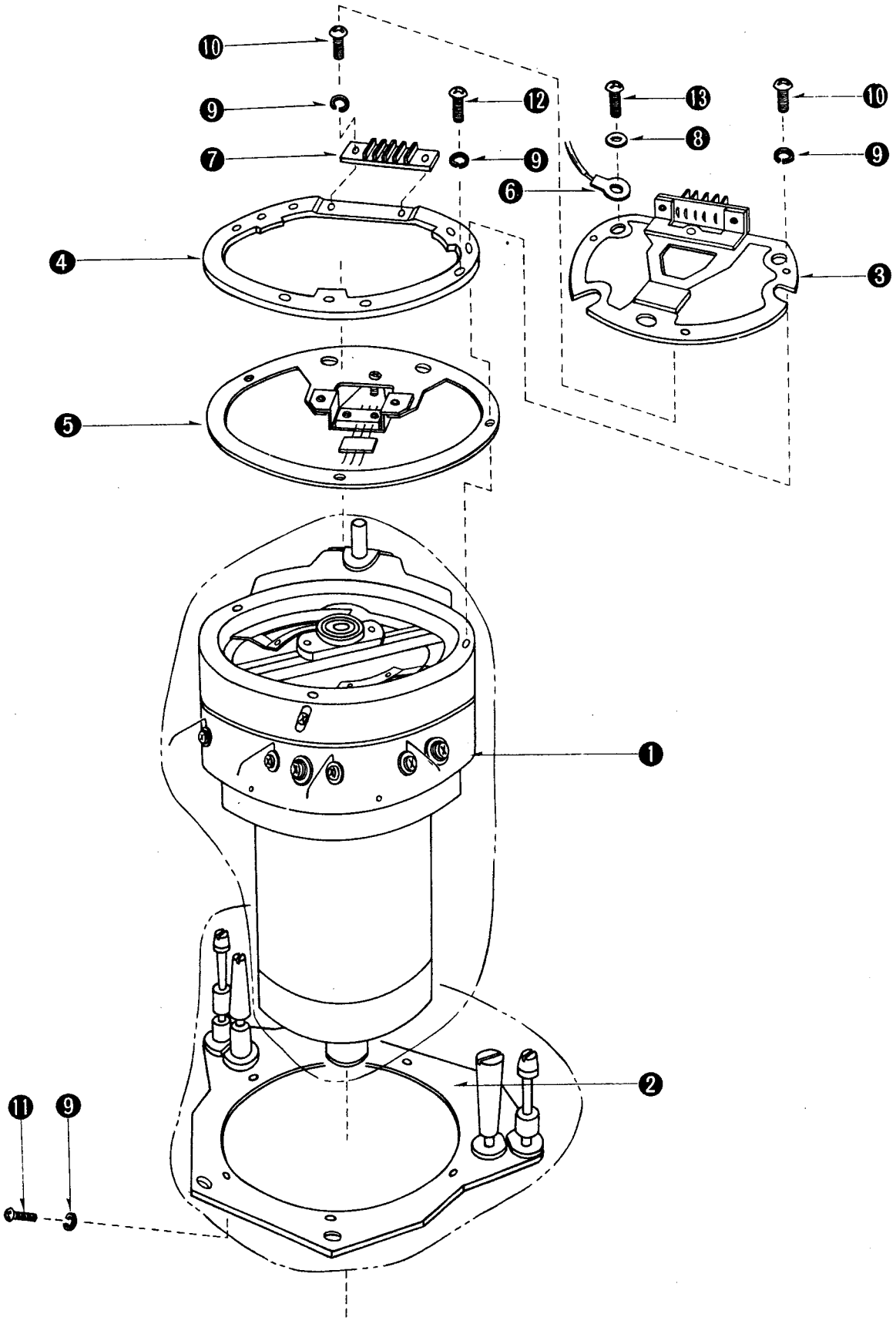
II. TAPE TRANSPORT MECHANISM BREAKDOWN

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
1	VEG-18	VIDEO HEAD Assembly	1	NV-1020E
1	VEG-13	VIDEO HEAD Assembly	1	NV-1020
2	VEH-3	ERASE HEAD Assembly, Full Track	1	
3	VEH-5-2	AUDIO/CONTROL HEAD Assembly	1	
4	VXA-6S-3	TAPE COUNTER Assembly	1	
5	VXP-7-1	PRESSURE ROLLER Assembly	1	
6	VXP-6	TAPE ROLLER Assembly	2	
7	VMS-13	CAPSTAN SHAFT	1	
8	VMS-14	50 c/s SLEEVE	1	See NOTE 1
9	VHD-1	LOCKING SCREW, Capstan Sleeve	1	
10	VDP-10	PULLEY, Tape Counter	1	
11	VMS-35S-1	CYLINDER, Pressure Roller	1	
12	VXH-1	PAD ARM	1	
13	VMB-19	SPRING, Pad Arm	1	
14	VMA-97-1	BRACKET, Top Panel Mounting	1	
15	VMA-56	BRACKET, Pad Arm Spring	1	
16	VAS-4	TAPE SHIFTER-E	1	
17	VDF-1	FLY WHEEL	1	
19	VDV-7-1	BELT, Capstan, Hard Finish*	1	See NOTE
20	VMP-6	OIL SUPPLIER, Capstan Shaft	1	
21	VXK-9-1	FRAME Assembly, Tape Tranport Chassis	1	
22	VMS-36	TAPE GUIDE POST B	1	
23	VMB-9	INTER-SPRING, Pressure Roller	1	
24	P-P3-4FY	SMALL SCREW, Phillips, 3×4		
25	P-P3-6FY	SMALL SCREW, Phillips, 3×6		
26	P-P3-8FY	SMALL SCREW, Phillips, 3×8		
27	P-P4-8FY	SMALL SCREW, Phillips, 4×8		
28	P-P4-10FY	SMALL SCREW, Phillips, 4×10		
29	VNT-3	FIBER WASHER, 3ϕ		
30	VNT-4	FIBER WASHER, 4ϕ		
31	VNT-9	FIBER WASHER, 9ϕ		
32	SW-3	SPRING WASHER, 3ϕ		
33	SW-4	SPRING WASHER, 4ϕ		
34	W-4	FLAT WASHER, 4ϕ		
35	EW-3	RETAINING RING, 3ϕ		
36	EW-8	RETAINING RING, 8ϕ		
37	VNW-3	WASHER, Pressure Roller Cylinder,		
38	VMF-1	FELT SPACER, Oil Supplier		
39	FN-4Y	HEX NUT, 4ϕ		

* **NOTE:** See NOTE on Page 17 for selection of the Belt and Capstan Pulley.

NOTE 1: This port is located on the capstan shaft VMS-13 when the power standard is 50 c/s.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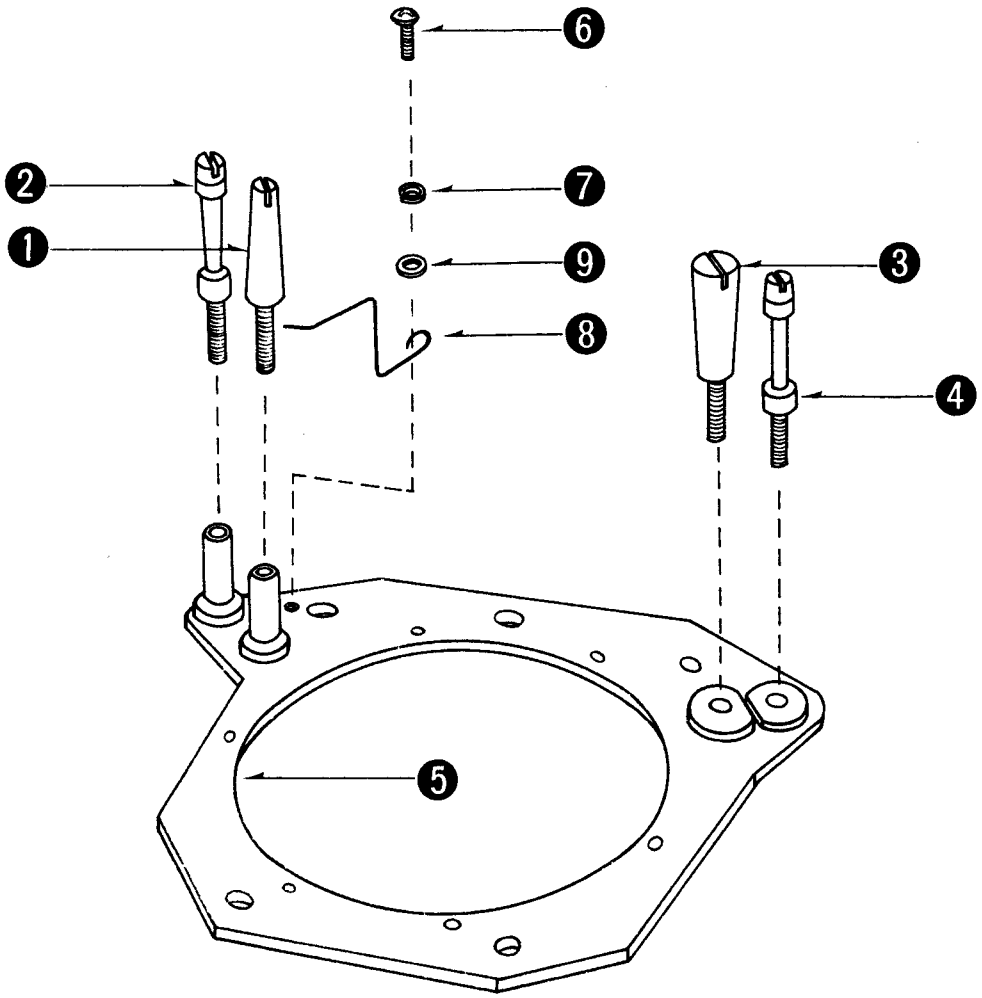
II-1-1. TAPE GUIDE DRUM Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-1-1	VEG-9	TAPE GUIDE DRUM Assembly	1	NV-1020
II-1-1	VEG-20	TAPE GUIDE DRUM Assembly	1	NV-1020E
1	ALTZ-1	VIDEO HEAD MOTOR Assembly	1	
2	VEG-6	DRUM, w/Supporter & Cleaner	1	
3	VEH-15-1	VIDEO HEAD BAR Assembly	1	NV-1020
3	VEH-15-2	VIDEO HEAD BAR Assembly	1	NV-1020
3	VEH-15-3	VIDEO HEAD BAR Assembly	1	NV-1020
3	VEH-16	VIDEO HEAD BAR Assembly	1	NV-1020E
4	VXC-3	HEAD CLEANER Assembly	1	
5	VAG-3	MOTOR SUPPORTER	1	
6	VXS-3-1	SLIPRING Assembly	1	
7	VAG-11-2	PIN, Centering	1	
8	VXS-4	SHAFT SLIPRING Assembly	1	NV-1020
9	VXS-2	BRUSH BASE Assembly, Motor Shaft	1	NV-1020
10	VAG-19-1	DISC PLATE	1	
11	VMA-225	ANGLE, Shaft Slipring Plate Mounting	1	
12	VMB-53	SPRING, Pressure	1	NV-1020E
13	VDF-3	FLY WHEEL, Video Head Motor	1	NV-1020E
14	VMA-226	SLIPRING PLATE, Motor Shaft Ground	1	NV-1020E
15	VSA-5	SLIPRING, Motor Shaft Ground	1	NV-1020E
16	VMS-69	BUSHING, Fly Wheel	1	NV-1020E
17	VSA-4	BRUSH, Motor Shaft Ground	1	
18	SW-2.6	SPRING WASHER, 2.6ϕ		
19	SW-3	SPRING WASHER, 3ϕ		
20	SW-4	SPRING WASHER, 4ϕ		
21	W-3	FLAT WASHER, 3ϕ		
22	CW-A2.6	LOCK WASHER, Internal, 2.6ϕ		NV-1020
23	P-P2.6-4FY	SMALL SCREW, Phillips, 2.6×4		NV-1020E
24	P-P2.6-6BN	SMALL SCREW, Phillips, 2.6×6		NV-1020E
25	P-P2.6-11FY	SMALL SCREW, Phillips, 2.6×11		
26	P-P3-6FY	SMALL SCREW, Phillips, 3×6		
27	P-P3-8FY	SMALL SCREW, Phillips, 3×8		
28	P-P4-8FY	SMALL SCREW, Phillips, 4×8		
29	P-P4-12FY	SMALL SCREW, Phillips, 4×12		
30	H4-6FP	HEX SCREW, Internal, 4×6		NV-1020E

[- - -] Parts exclusive for NV-1020.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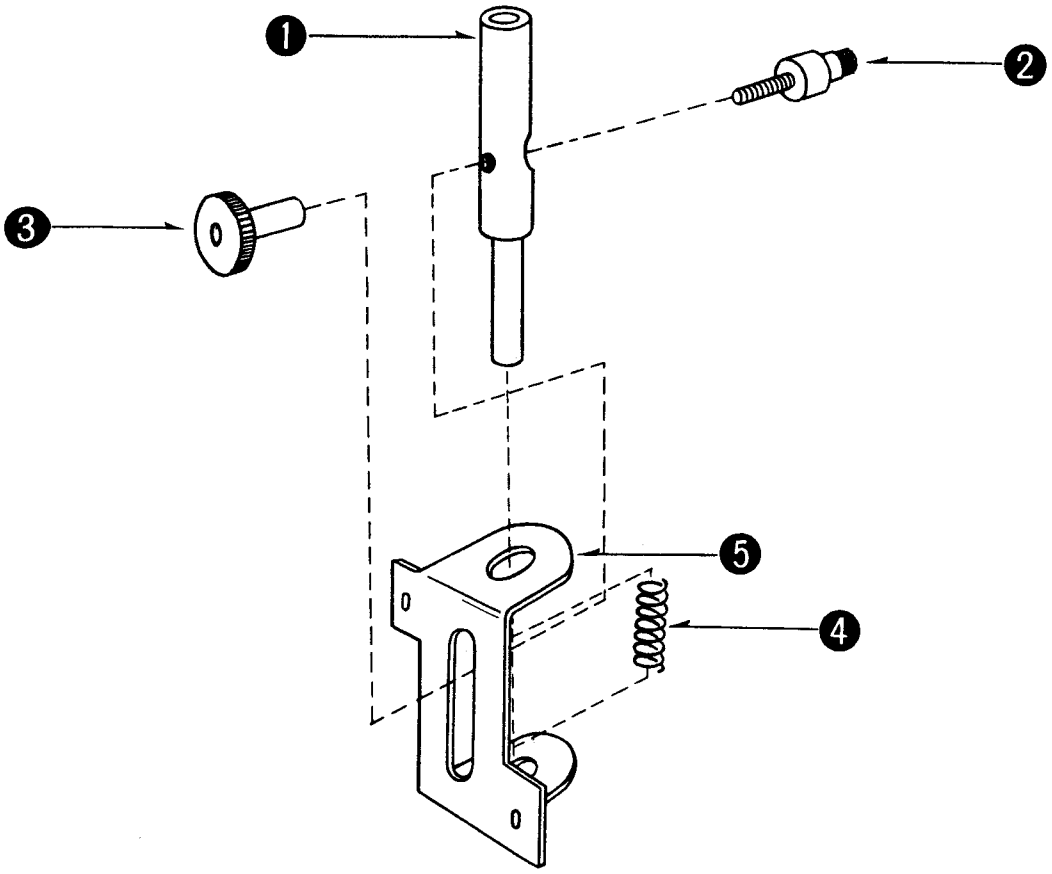
II-1-4. HEAD CLEANER Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-1-4	VXC-3	HEAD CLEANER Assembly	1	
1	VMC-1-1	SHAFT, Head Cleaner	1	
2	VXC-13	BRUSH, Head Cleaner	1	
3	VMC-3	NUT, Cleaner Locking	1	
4	VMB-12	SPRING, Head Cleaner	1	
5	VMC-5	ANGLE, Head Cleaner	1	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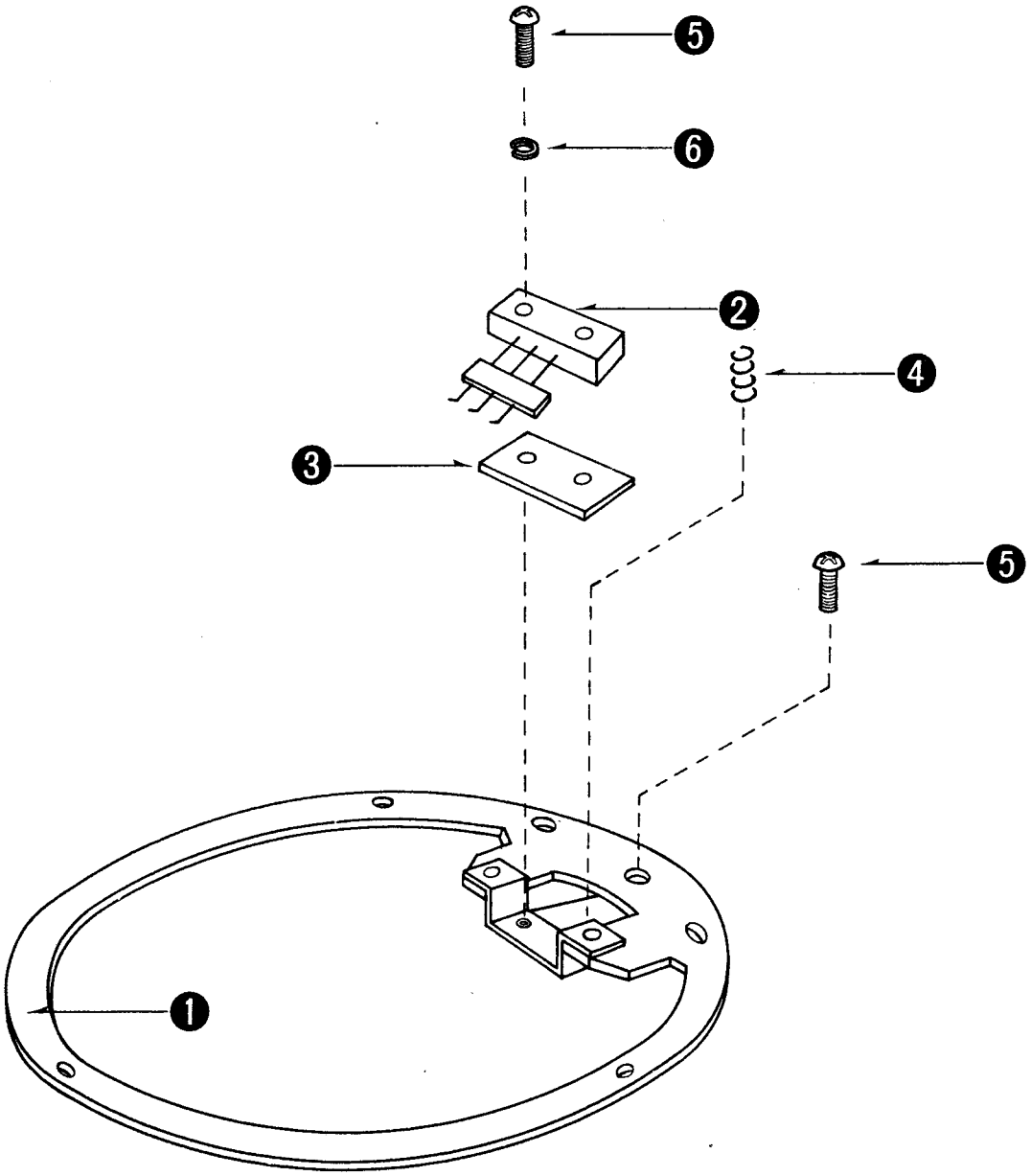
II-1-5. SLIPRING BRUSH Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-1-5	VXS-1S-1	SLIPRING BRUSH Assembly	1	
1	VXK-18	HOLDER, Slipring Brush	1	
2	VSA-7	BRUSH, Slipring	1	
3	VMZ-24	SPACER, Slipring Brush	1	
4	VMB-3	SPRING, Brush Pressure	1	
5	P-P3-6FY	SMALL SCREW, Phillips, 3×6		
6	SW-3	SPRING WASHER, 3ϕ		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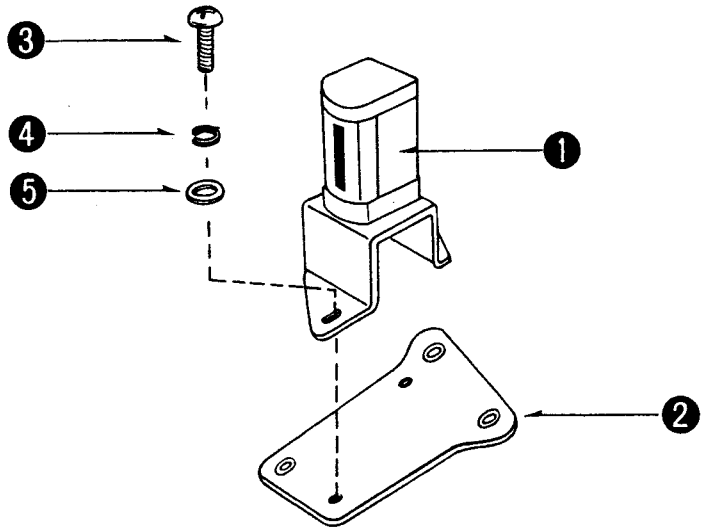
II-2. FULL TRACK ERASE HEAD Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-2	VEH-3	ERASE HEAD ASSEMBLY, Full Track	1	
1	WY 707Z	ERASE HEAD, Full Track	1	
2	VMA-25	BRACKET, Erase Head Mounting	1	
3	P-P2-6FY	SMALL SCREW, Phillips, 2×6		
4	SW-2	SPRING WASHER, 2ϕ		
5	W-2	FLAT WASHER, 2ϕ		

II-3 AUDIO/CONTROL HEAD Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-3	VEH-5-2	AUDIO/CONTROL HEAD Assembly	1	
1	WY-733-1	AUDIO ERASE HEAD	1	
2	WY-619V	AUDIO/CONTROL HEAD	1	
3	VXK-12-1	BRACKET, Audio/Control Head	1	
4	VMA-48	SPACER, Audio Erase Head	1	
5	P-P2-6FY	SMALL SCREW, Phillips, 2×6		
6	SW-2	SPRING WASHER, 2ϕ		
7	W-2	WASHER, 2ϕ		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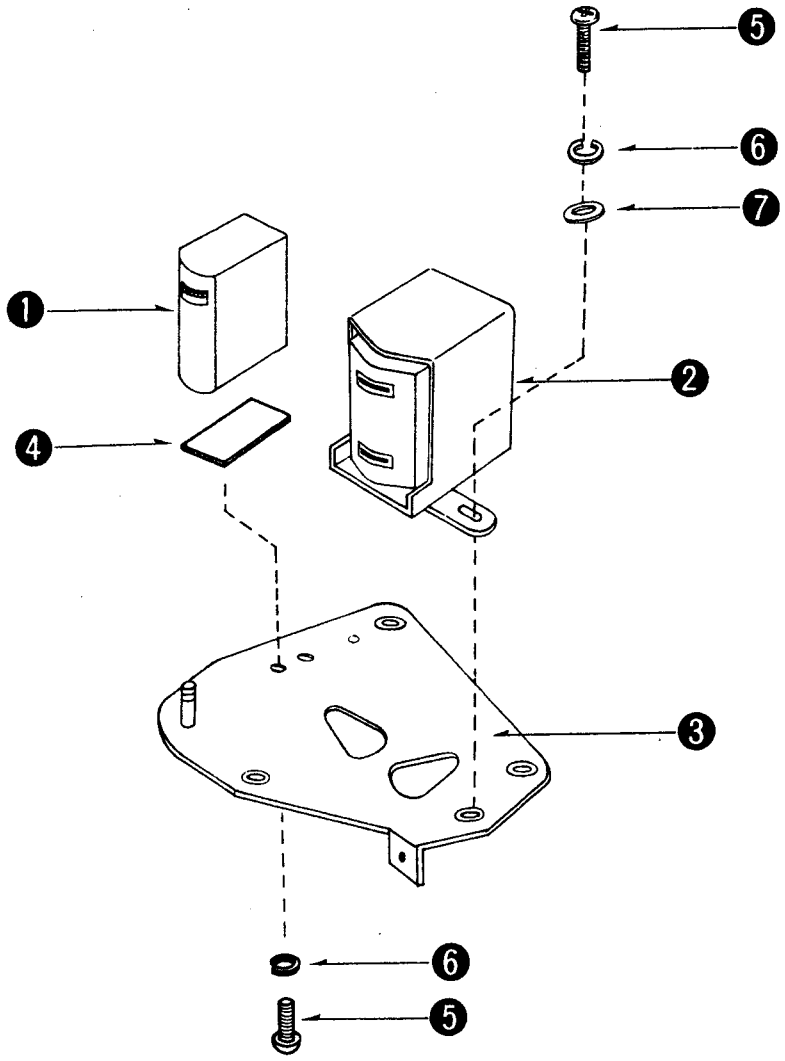
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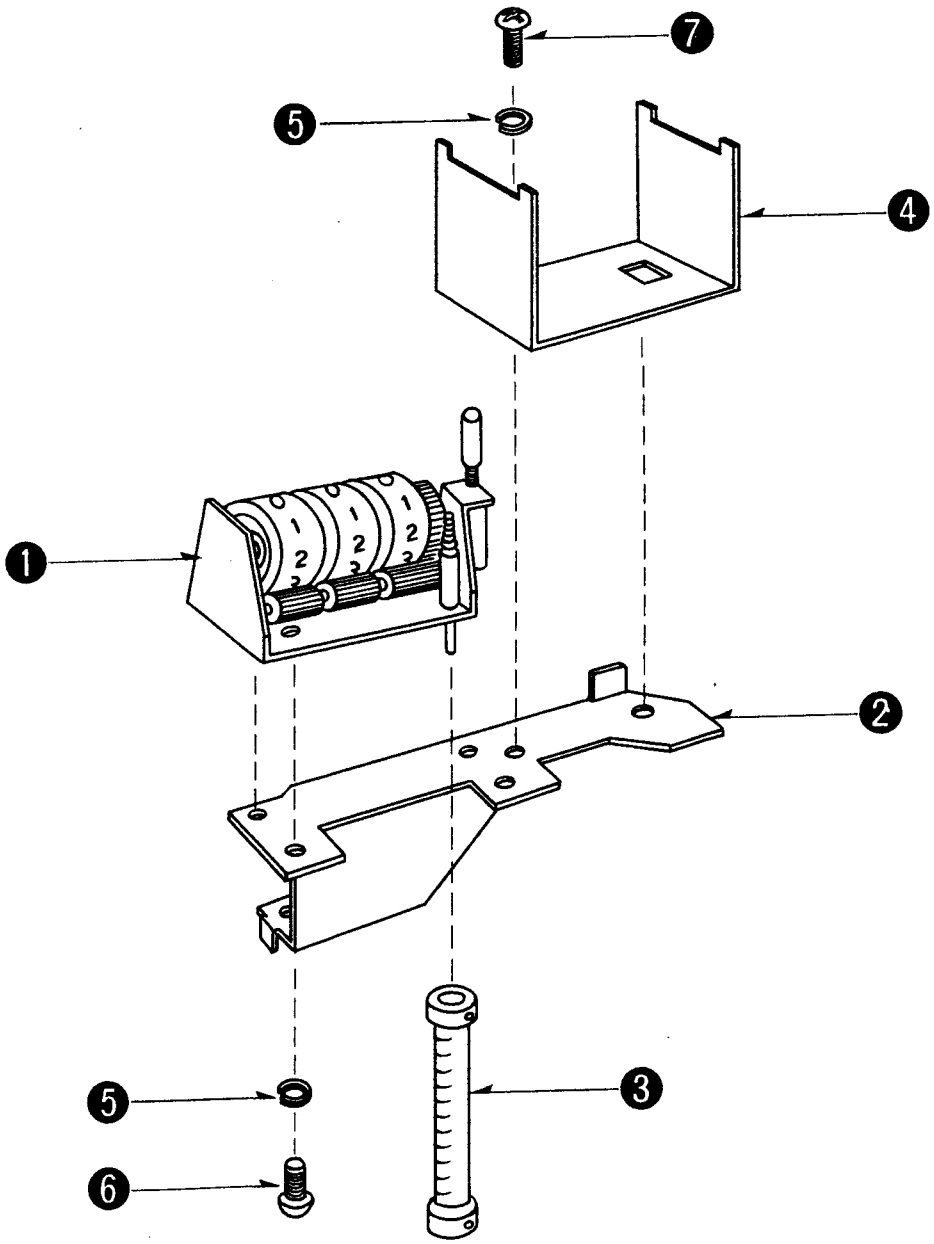
II-4. TAPE COUNTER Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-4	VXA-6S-3	TAPE COUNTER Assembly	1	
1	VDC-1	DIGITAL COUNTER	1	
2	VMA-31-4	BRACKET, Counter Mounting	1	
3	VMB-24-2	SPRING PULLEY, Tape Counter	1	
4	VMA-32	BRACKET, Level Meter Mounting	1	
5	SW-3	SPRING WASHER, 3ϕ		
6	P-P3-6FY	SMALL SCREW, Phillips, 3×6		
7	DSTBR3-6FY	TAPPING SCREW, 3×6		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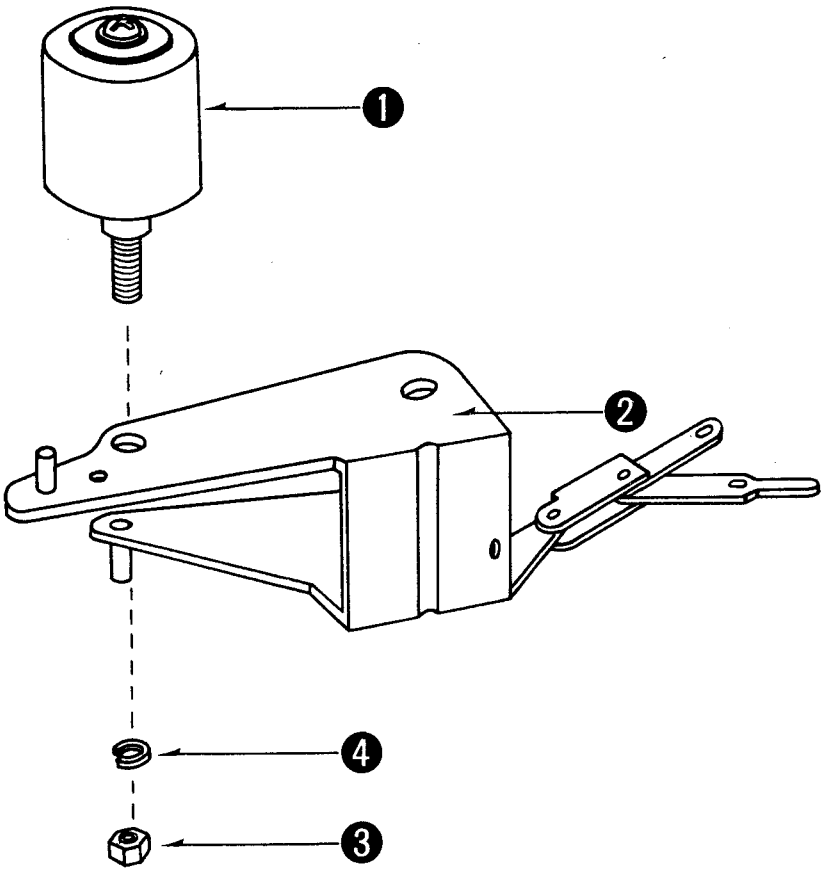
II-5. PRESSURE ROLLER Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-5	VXP-7-1	PRESSURE ROLLER Assembly	1	
1	VXP-1S-4	PRESSURE ROLLER	1	
2	VXL-1-1	BRACKET, Pressure Roller	1	
3	FN-4Y	HEX NUT, 4ϕ	1	
4	SW-3	SPRING WASHER, 3ϕ	1	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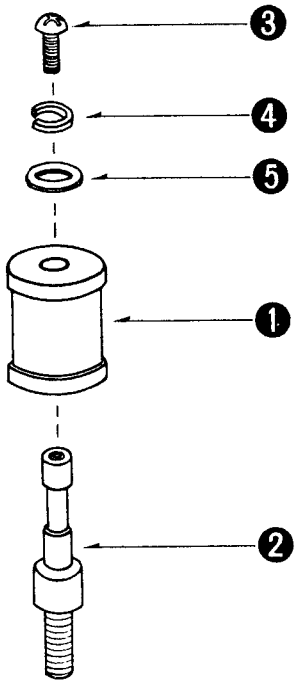
II-6. TAPE ROLLER Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-6	VXP-6	TAPE ROLLER Assembly	2	
1	VDP-3	TAPE ROLLER	1	
2	VMS-15	SHAFT, Tape Roller	1	
3	P-P3-6FY	SMALL SCREW, Phillips, 3×6	1	
4	SW-3	SPRING WASHER, 3ϕ	1	
5	W-3	WASHER, 3ϕ	1	

II-21. TAPE TRANSPORT CHASSIS FRAME Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-21	VXK-9-1	FRAME Assembly, Tape Transport Chassis	1	
1	VMS-36	TAPE GUIDE POST-B	1	
2	VXP-6	TAPE ROLLER Assembly	2	
3	VEH-3	ERASE HEAD Assembly, Full Track	1	
4	VEH-5-2	AUDIO/CONTROL HEAD Assembly	1	
5	VMB-2	SPRING, Head Mounting	6	
6	VAS-1	TAPE SHIFTER	1	
7	VXK-8-1	CHASSIS, Tape Transport	1	
8	P-S3-12FY	FLAT SCREW, Phillips, 3×12		
9	P-P3-6FY	SMALL SCREW, Phillips, 3×6		
10	SW-3	SPRING WASHER, 3ϕ		
11	W-3	WASHER, 3ϕ		

CAUTION: When any of the parts 1 through 4 is replaced, be sure to check the tape interchangeability.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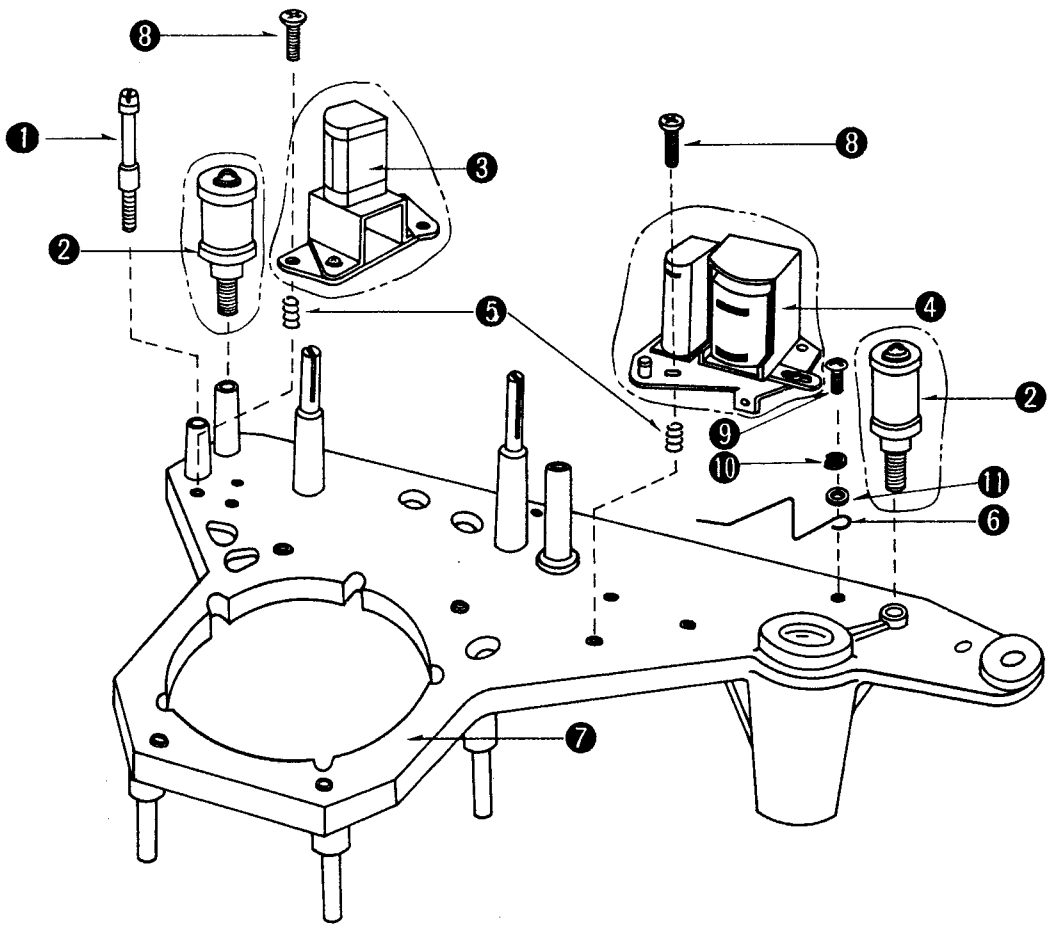
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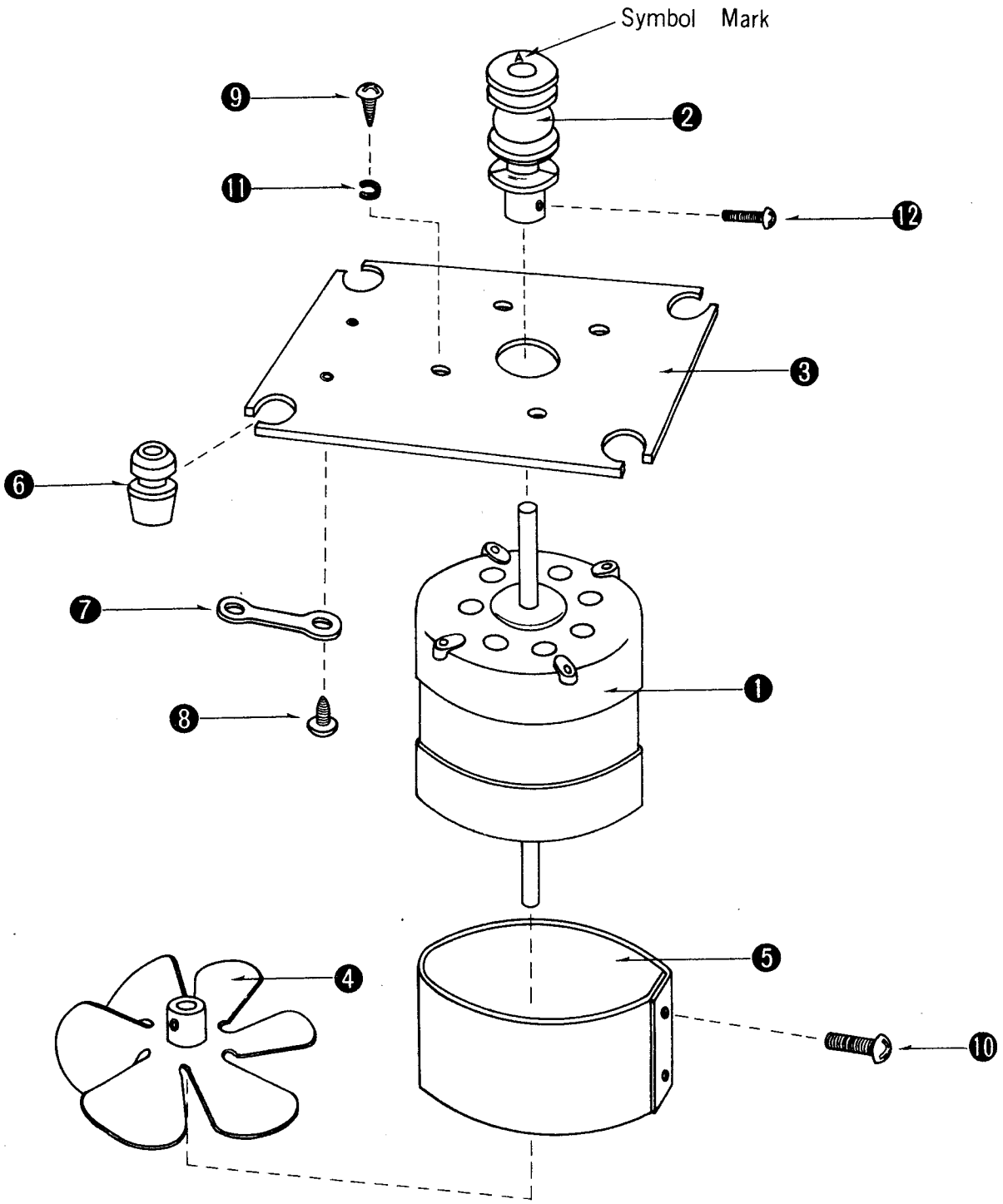
III. TAPE DRIVE MECHANISM BREAKDOWN

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
1	VEM-3	CAPSTAN MOTOR Assembly	1	See NOTE
2	VXR-7-2	TURN TABLE Assembly, Supply Reel	1	
3	VXP-2	PULLEY, Takeup Reel	1	
4	VXR-1S	TABLE Assembly, Takeup Reel	1	
5	VXP-9-1	ROLLER Assembly, Rewind	1	
5	VXP-8	ROLLER Assembly, Fast Forward	1	
7	VXZ-1-1	BRAKE Assembly, Takeup Reel	1	
8	VXZ-2-1	BRAKE Assembly, Supply Reel	1	
9	VXP-3S-1	PULLEY, Tape Counter	1	
10	VMA-16	RETAINER, Takeup Reel Metal	1	
11	VDB-2	BEARING METAL, Takeup Reel	1	
12	VDV-6	BELT, Tape Counter Drive	1	
13	VDV-2-1	BELT, Takeup Reel Drive	1	
14	VDV-3	BELT, Rewind Pulley Drive	1	
15	VXM-1	BRAKE ROD	1	
16	VMM-2	ROD ARM, Takeup Reel Drive	1	
17	VXM-3	ROD, Rewind Drive	1	
18	VXM-2-1	ROD, Fast Forward Drive	1	
19	VMA-15	BRACKET, Takeup Reel Shaft	1	
20	VMP-8	CAM, Takeup Reel	1	
21	VMB-15	SPRING, Brake Arm	2	
22	VMB-17-1	SPRING, Brake Rod	1	
23	VMA-34	THRUST, Capstan Motor Mounting	4	
24	VXA-2	PULLEYS, Brake String	1	
25	VMW-1	STRING, Brake Drive, 1 m	1	
26	SW-3	SPRING WASHER, 3ϕ		
27	EW-3	RETAINING RING, 3ϕ		
28	EW-4	RETAINING RING, 4ϕ		
29	EW-5	RETAINING RING, 5ϕ		
30	VNT-4	FIBER WASHER, 4ϕ		
31	VNT-6	FIBER WASHER, 6ϕ		
32	VNT-7	FIBER WASHER, 7ϕ		
33	VNT-8	FIBER WASHER, 8ϕ		
34	P-P3-6FY	SMALL SCREW, Phillips, 3×6		
35	P-P3-14FY	SMALL SCREW, Phillips, 3×14		
36	P-P4-25FY	SMALL SCREW, Phillips, 4×25		
37	VHD-2	LOCKING SCREW, Capstan Motor	4	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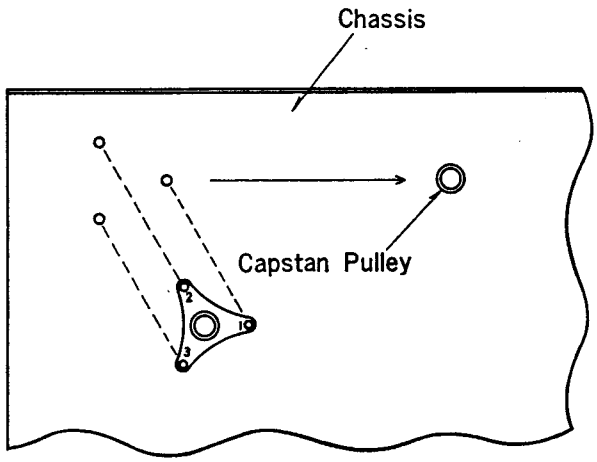
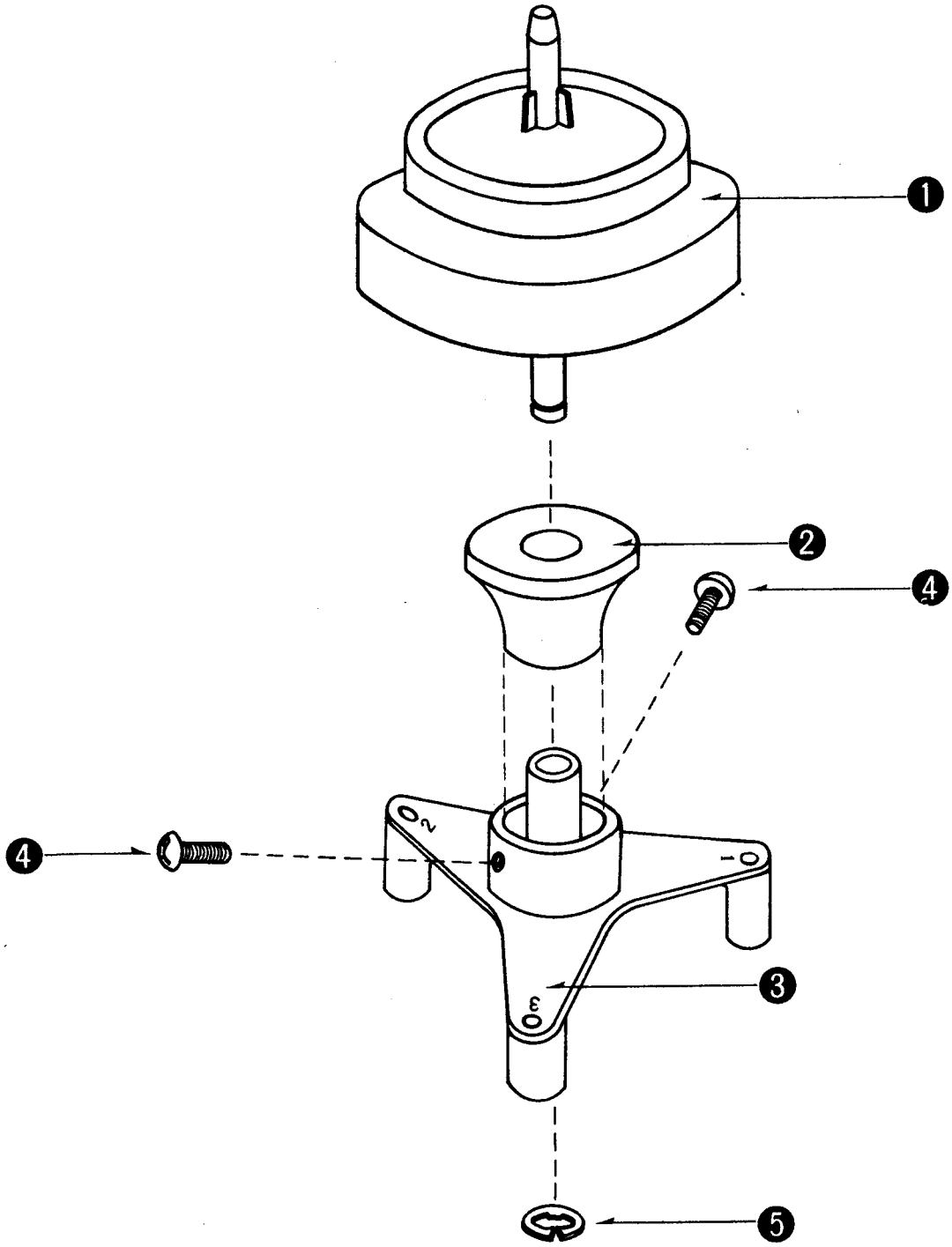
III-2. SUPPLY REEL TURN TABLE Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
III-2	VXR 7S 2	TURN TABLE Assembly, Supply Reel	1	
1	VXR 2-2	TABLE Assembly, Supply Reel	1	
2	VDB-9	COLLAR, Supply Reel Table	1	
3	VDR-27S 1	SUPPORTOR, Supply Reel Mounting	1	
4	P-P3-10FAT	SMALL SCREW, Phillips, 3×10	2	
5	EW-5	RETAINING RING, 5ϕ	3	

NOTE:

When installing VXR-7 on the Chassis, be sure to confirm the figures marked on VDR-10. It should be so mounted that the foot numbered 1 faces the Capstan Pulley as shown at right.

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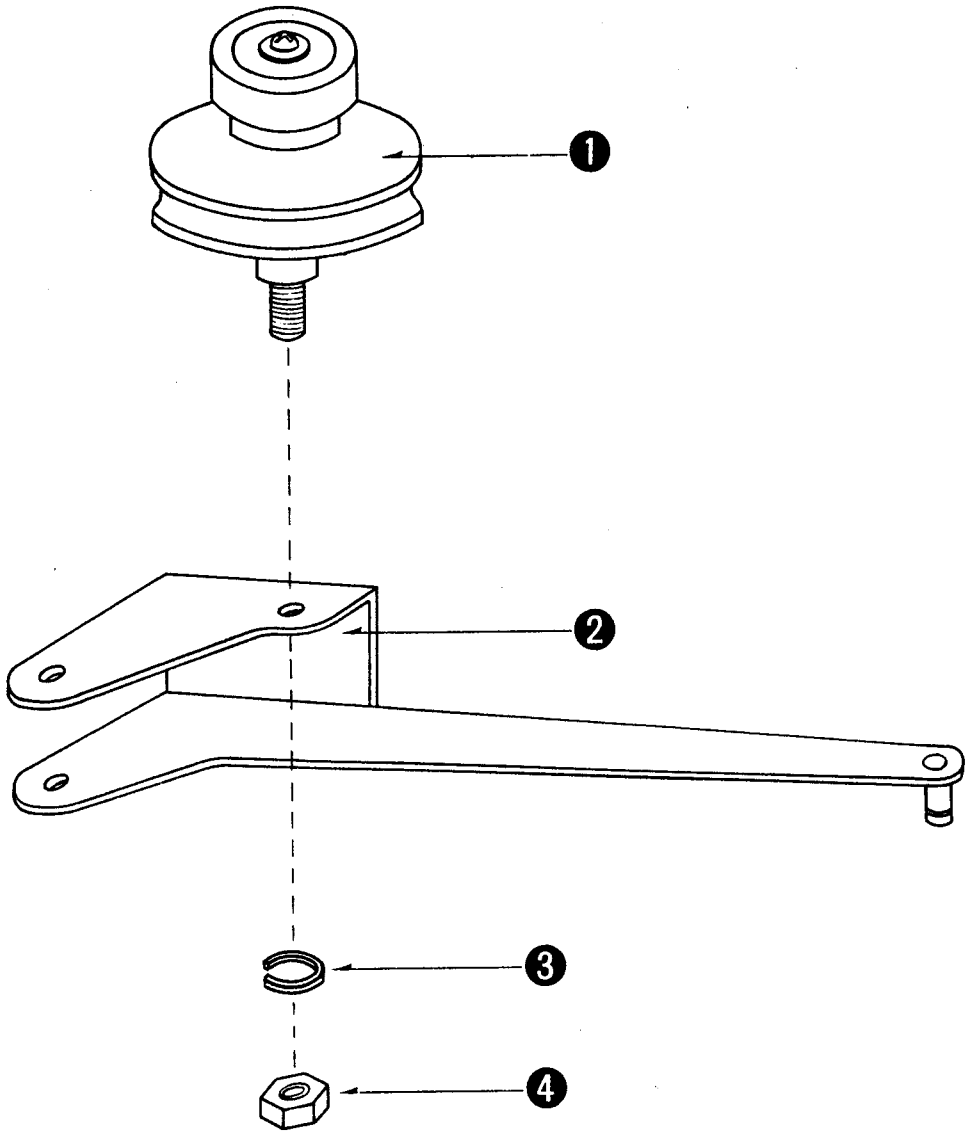
III-5. REWIND ROLLER Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
III-5	VXP-8	ROLLER Assembly, Rewind	1	
1	VXP-5S	ROLLER UNIT, Rewind	1	
2	VXL-5-1	ARM, Rewind Roller	1	
3	SW-4	SPRING WASHER, 4ϕ	1	
4	FN-4Y	HEX NUT, 4ϕ	1	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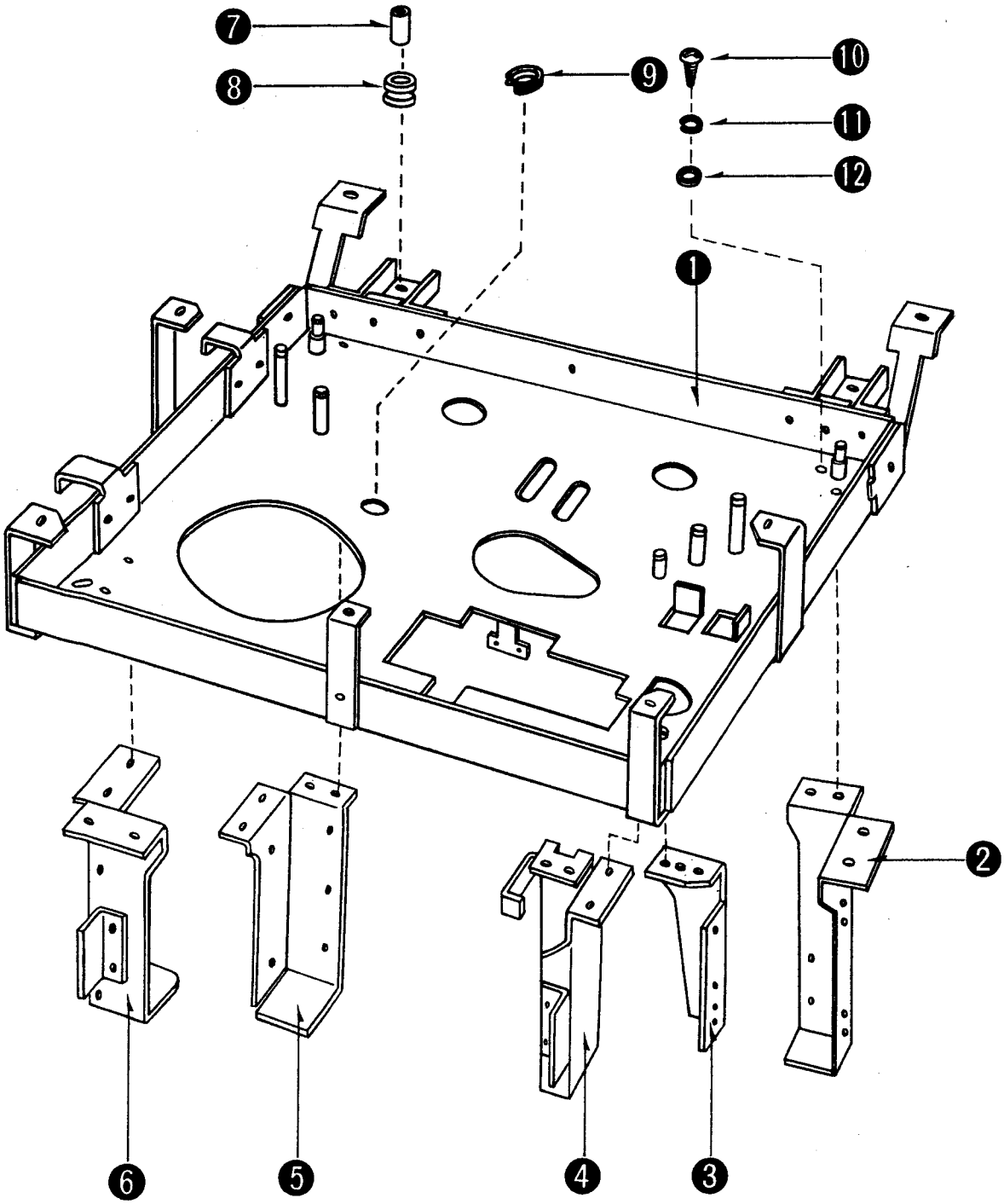
III-6. FAST FORWARD ROLLER Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
III-6	VXP-9-1	ROLLER Assembly, Fast Forward	1	
1	VXP-4S	ROLLER UNIT, Fast Forward	1	
2	VXL-4	ARM, Fast Forward	1	
3	SW-4	SPRING WASHER, 4ϕ	1	
4	FN-4	HEX NUT, 4ϕ	1	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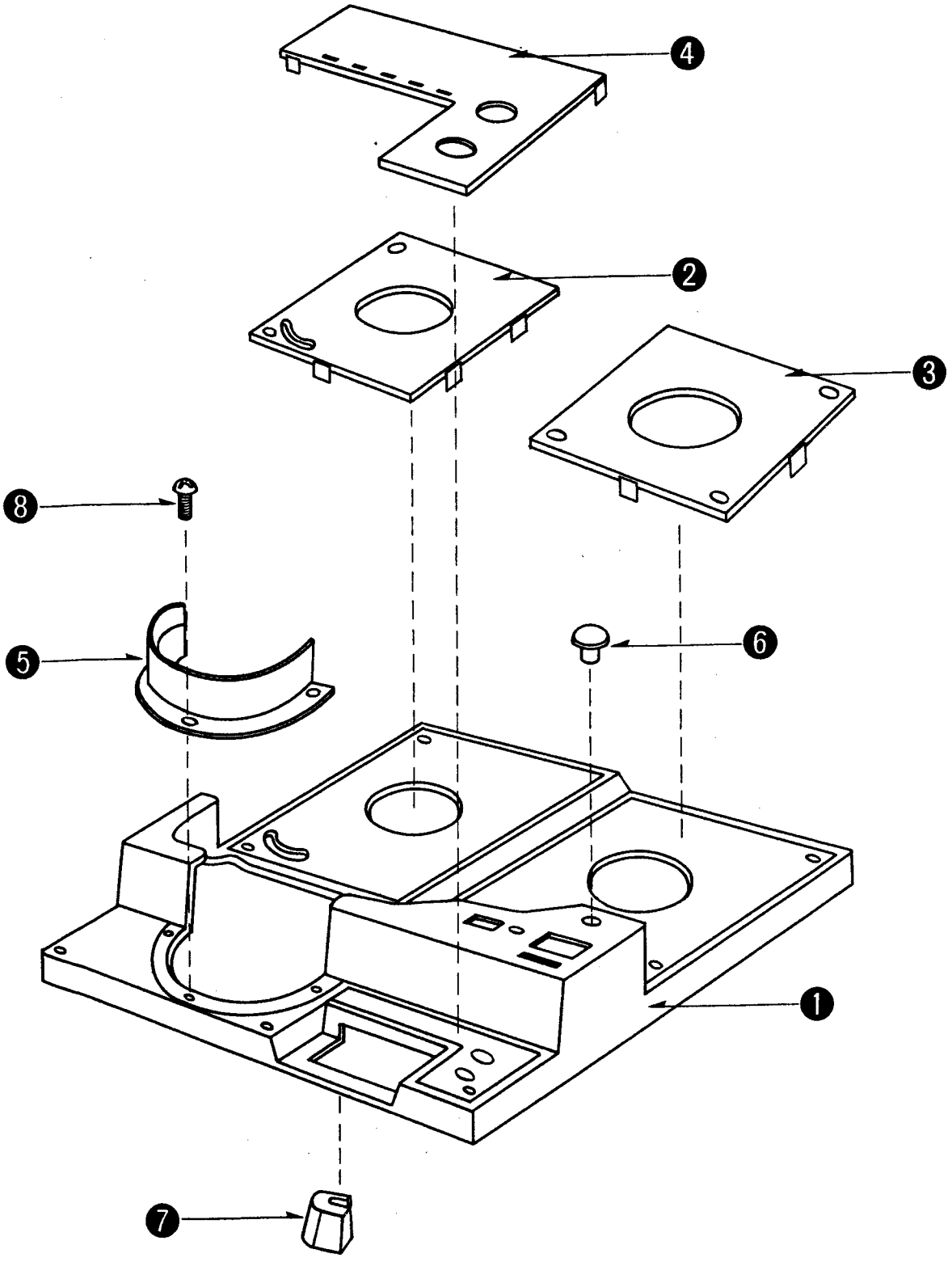
V. CASING

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
1	VYP-2-2	TOP PANEL Assembly	1	
2	VYF-5	HEAD CAP Assembly	1	
3	VYK-9	ENCLOSURE	1	Assembled with lid
4	VGN-46-1	NAME PLATE	1	NV-1020E
4	VGN-46	NAME PLATE	1	NV-1020
5	VJA-10	POWER CABLE, Flat Blades	1	
5-1	VJP-11	ADAPTOR PLUG, C-2P *	1	NV-1020E
5-1	VJP-12	ADAPTOR PLUG, B-2P *	1	NV-1020E
6	VFS-1	SPLICING TAPE, 30 cm	1	
7	VGT-5	VOLUME KNOB	2	
8	VMF-7-1	SPACER, Control Knob	2	
9	VMG-4	CUSHION, Head Protector	1	
10	VGM-1B	MOUNT, Head Protection	1	
11	VMG-13	RUBBER SPACER, Tape Transport	1	
12	VMT-1	INDICATOR CUSHION	1	
13	VGB-8	NATIONAL BADGE	1	
14	VPF-37	NYLON BAG, Empty Reel	1	
15	VFR-0712N	EMPTY REEL	1	
16	VQL-8	UL MARK	1	NV-1020
17	VHN-1	SPEED NUT, Badge Holding	2	
18	P-P5-15FY	SMALL SCREW, Phillips, 5×15		
19	SW-5	SPRING WASHER, 5ϕ		
20	W-5	FLAT WASHER, 5ϕ		

NOTE: *One of these is attached as a standard accessory.

PANEL SCREWS (See PANEL SCREW LOCATIONS DIAGRAM)

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
1	P-MS3-45FC	PANEL SCREW, Phillips, 3×45	1	
2	P-MS3-40FC	PANEL SCREW, Phillips, 3×40	2	
3	P-MS3-30FC	PANEL SCREW, Phillips, 3×30	2	
4	P-MS3-10FC	PANEL SCREW, Phillips, 3×10	3	
All these screws are set with the following washers;				
5	VNW-8	PANEL WASHER, 3ϕ	8	
6	VNT-12	NYLON WASHER, 3ϕ	8	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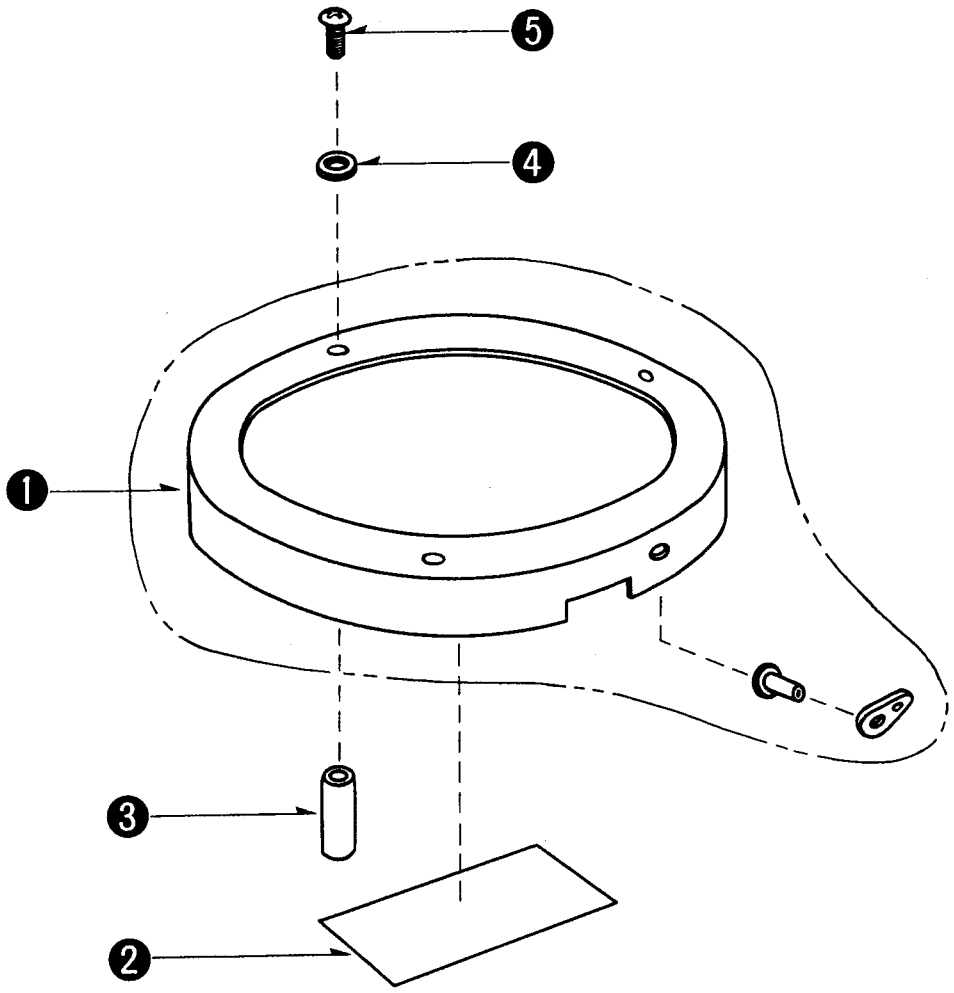
V-2. HEAD CAP Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
V-2	VYF-5	HEAD CAP Assembly	1	
1	VGH-1	HEAD CAP	1	
2	VQL-6	CAUTION LABEL	1	
3	VDB-15	SPACER, Head Cap	1	
4	VNT-10	NYLON WASHER, 3ϕ	3	
5	P-T3-15BC	CAP SCREW, Phillips, 3×15	3	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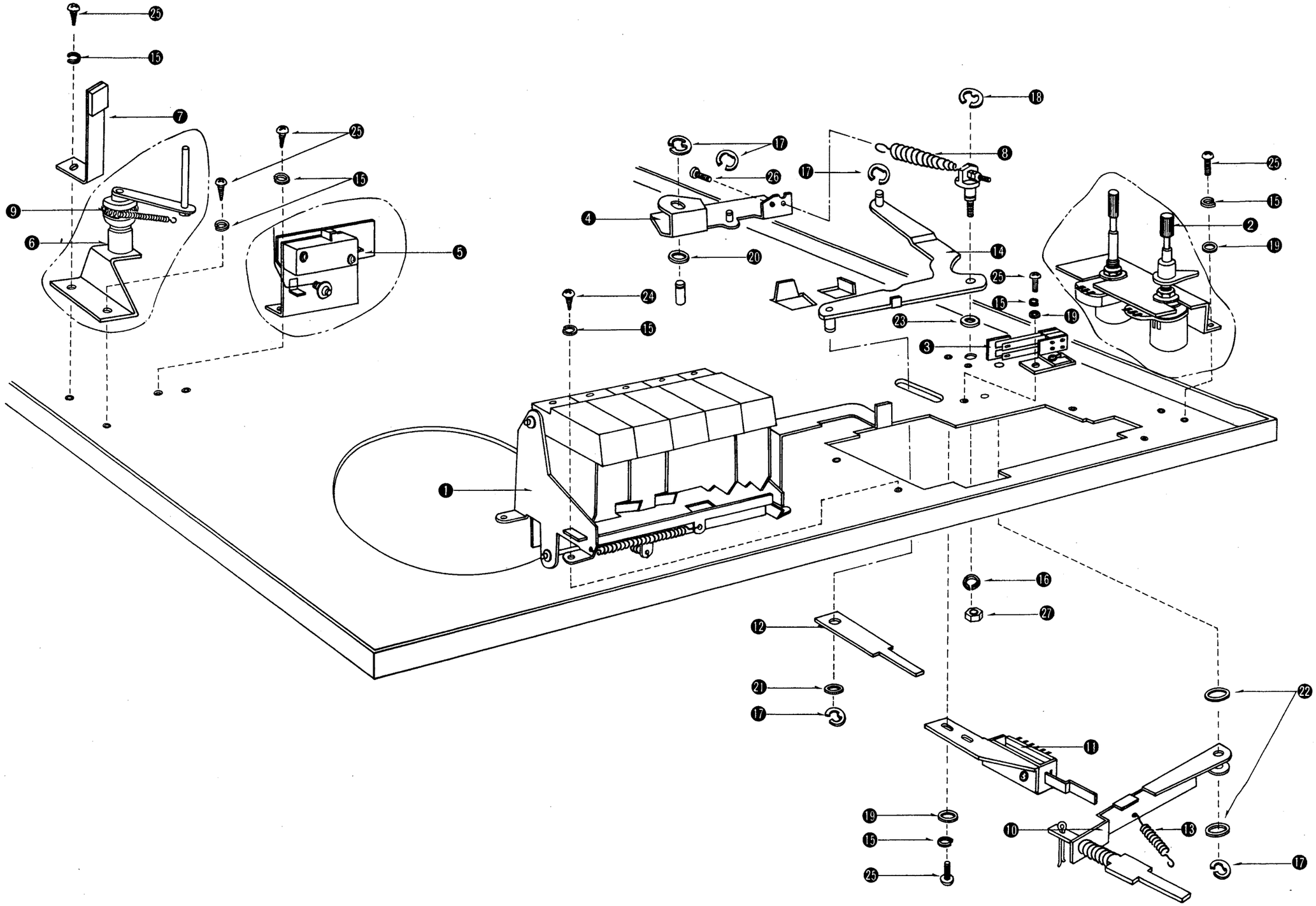
VI. PACKING

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
1	VQF-9	INSTRUCTION BOOK	1	
2	VPF-1	VINYL BAG, Packing	1	
3	VPN-2	BOTTOM/SIDE INSERT	1	
4	VPN-3	SIDE PAD	2	
5	VPG-55	INNER CARTON *	1	NV-1020E
6	VPN-4	TOP PAD	1	
8	VPN-6	CABLE PAD	1	
9	VPN-5	TOP/BOTTOM INSERT	2	
10	VPG-0002	CORNER INSERT	4	
11	VPG-54	OUTER CARTON *	1	NV-1020E

NOTE: Nominate VTR model number when these parts are ordered.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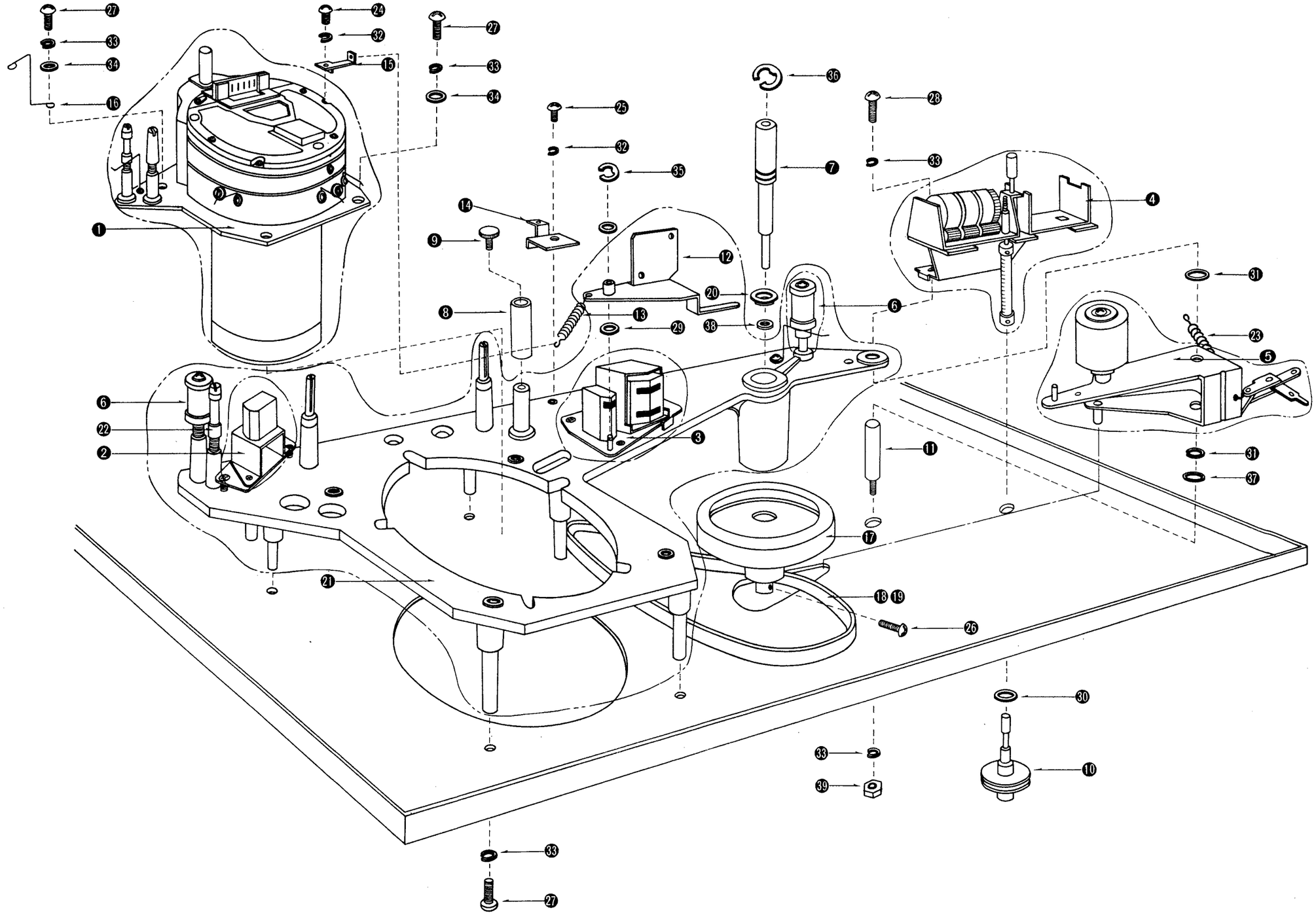
I-2. LEVEL CONTROL Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
I-2	VXA-18-2	LEVEL CONTROL Assembly	1	
2	EVC-B45U40A24	LEVEL CONTROL, Audio	1	
3	EVR-20HL40B32	LEVEL CONTROL, Video	1	
4	VXA-1-1	ARM, Pressure Roller Release	1	
5	VMA-9	ANGLE, Level Control	1	
6	VNW-6	WASHER, Video Control	1	
7	VNW-7	WASHER, Audio Control	1	
8	VNW-10	SPLIT WASHER, 10ϕ	1	
9	VNW-11	SPLIT WASHER, 11ϕ	1	
10	-	HEX NUT, Audio Control*	1	
11	-	HEX NUT, Video Control*	1	

* The Controls are supplied with the washers and the nuts.

NOTE: Reference No. 1 is deleted.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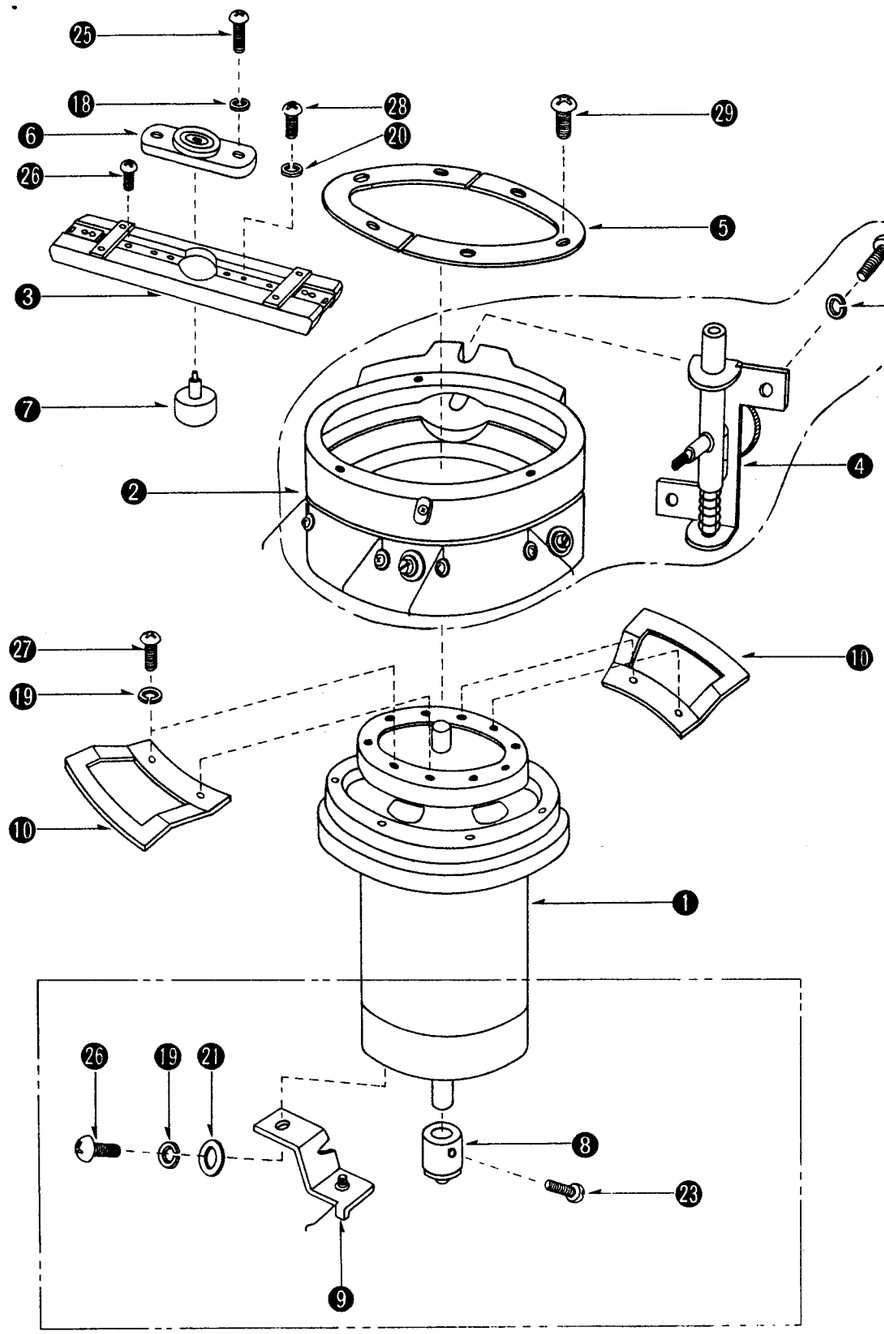
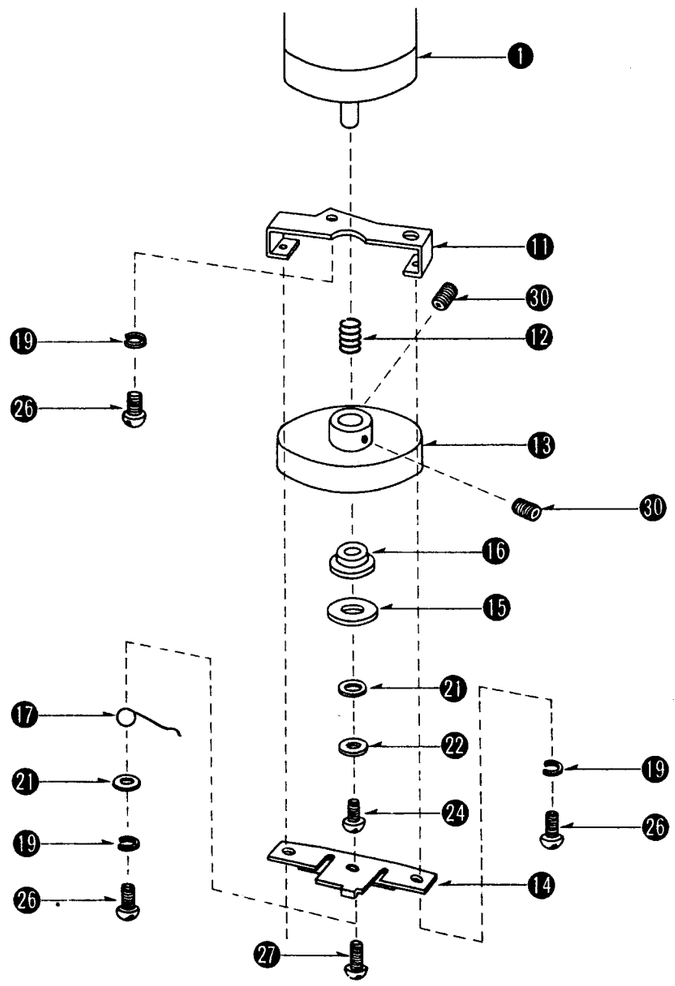
II-1. VIDEO HEAD Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-1	VEG-18	VIDEO HEAD Assembly	1	NV-1020E
II-1	VEG-13	VIDEO HEAD Assembly	1	NV-1020
1	VEG-9	TAPE GUIDE DRUM Assembly	1	NV-1020
1	VEG-20	TAPE GUIDE DRUM Assembly	1	NV-1020E
2	VXK-10-1	SUPPORTER Assembly, Tape Guide D	1	
3	VEP-502K	PRINTED CIRCUIT BOARD Assembly, R/PB Amplifier	1	See NOTE
4	VAG-13S	SPACER, R/PB Amplifier	1	
5	VXS-1S	BRUSH Assembly, Slipring	1	
6	VEV-3	TERMINAL, Ground	1	
7	VJH-2	TERMINAL, R/PB Amplifier	1	
8	CW-A3	LOCK WASHER, Internal, 3ϕ		
9	SW-3	SPRING WASHER, 3ϕ		
10	P-P3-6FY	SMALL SCREW, Phillips, 3×6		
11	P-P3-8FY	SMALL SCREW, Phillips, 3×8		
12	P-P3-10FY	SMALL SCREW, Phillips, 3×10		
13	P-P3-10BC	SMALL SCREW, Phillips, 3×10		

NOTE: See the ELECTRICAL PARTS breakdown on the list attached on the Service Manual.



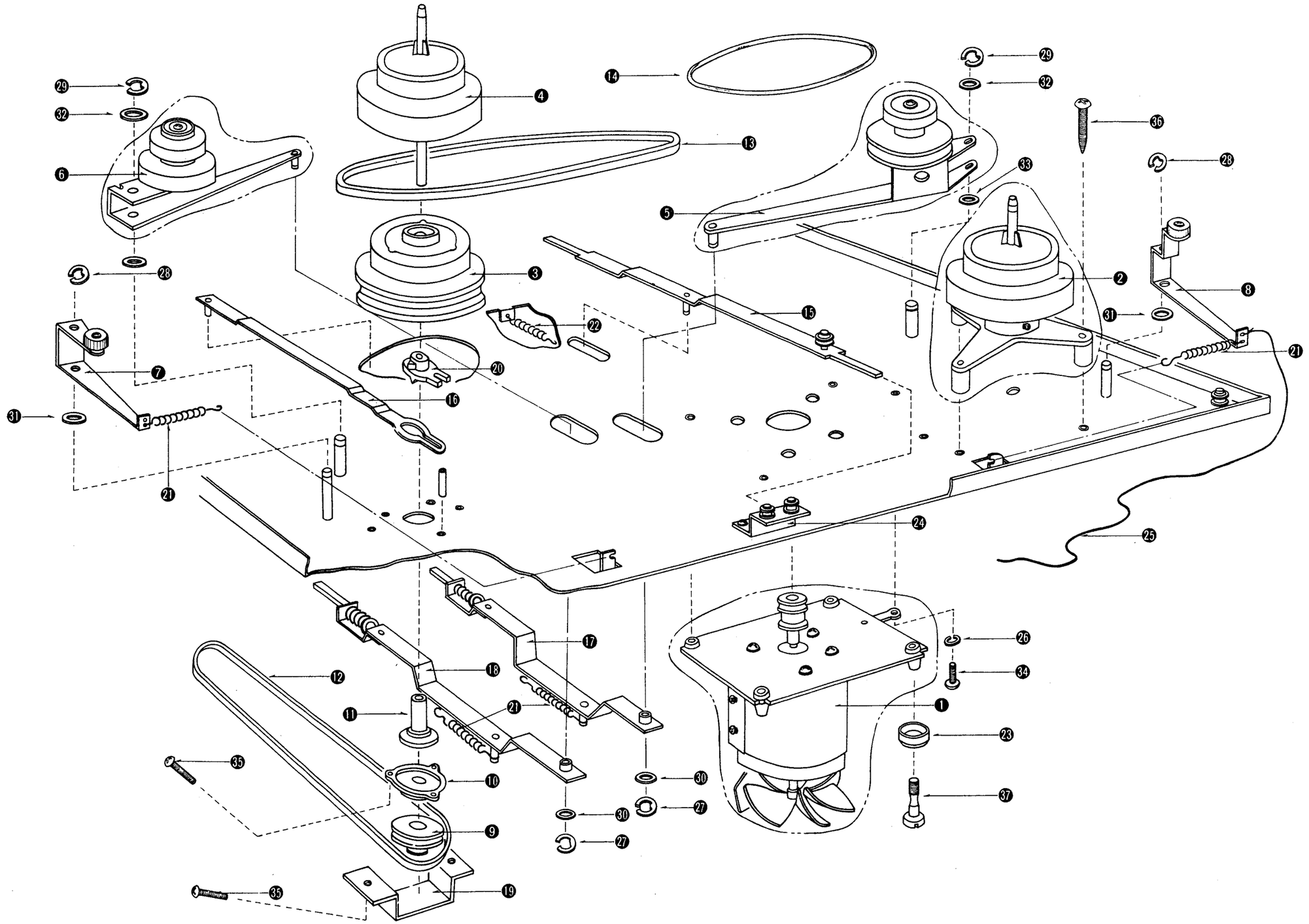
The parts illustrated below are equipped at the bottom of VIDEO HEAD MOTOR ASSEMBLY specially for NV-1020E. Note these parts are exclusive and only provided for NV-1020E.



II-1-2. TAPE SUPPORTER Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
II-1-2	VXK-10-1	TAPE SUPPORTER Assembly	1	
1	VMS-32-2	TAPER POST-A*	1	
2	VMS-31	TAPE GUIDE POST-A*	1	
3	VMS-33-2	TAPER POST-B*	1	
4	VMS-36	TAPE GUIDE POST-B*	1	
5	VXK-2S-1	SUPPORTER, Tape Guide Drum	1	
6	P-P3-4FY	SMALL SCREW, Phillips, 3×6		
7	SW-3Y	SPRING WASHER, 3ϕ		
8	VAS-2	TAPE SHIFTER-B		
9	W-3	FLAT WASHER, 3ϕ		

* When one of these parts is replaced, adjust the replaced parts only for optimum playback condition. It is not recommended to readjust the other parts along the tape transport for tape interchangeability.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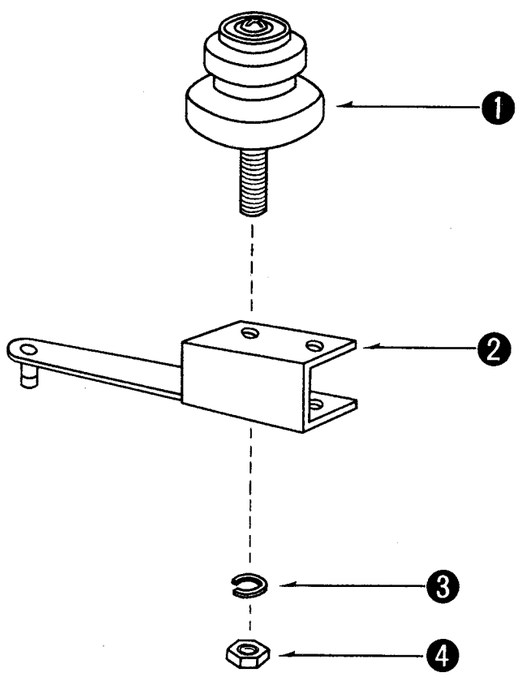
III-1. CAPSTAN MOTOR Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
III-1	VEM-3-1	CAPSTAN MOTOR Assembly	1	
1	2KSC-30AP	CAPSTAN MOTOR	1	
2	VDP-28*	PULLEY-A', Capstan Motor, 15.60ϕ	1	NV-1020
2	VDP-29*	PULLEY-B', Capstan Motor, 15.67ϕ	1	NV-1020
2	VDP-30*	PULLEY-C', Capstan Motor, 15.74ϕ	1	NV-1020
2	VDP-32*	PULLEY-Y, Capstan Motor, 15.53ϕ	1	NV-1020
2	VDP-39*	PULLEY-I, Capstan Motor, 15.28ϕ	1	NV-1020
2	VDP-40*	PULLEY-J, Capstan Motor, 15.35ϕ	1	NV-1020
2	VDP-41*	PULLEY-K, Capstan Motor, 15.42ϕ	1	NV-1020
2	VDP-42*	PULLEY-L, Capstan Motor, 14.73ϕ	1	NV-1020E
2	VDP-43*	PULLEY-M, Capstan Motor, 14.80ϕ	1	NV-1020E
2	VDP-44*	PULLEY-N, Capstan Motor, 14.87ϕ	1	NV-1020E
3	VMK-5-4	PLATE, Motor Mounting	1	
4	VSQ-1	FAN, Capstan Motor	1	
5	VSC-6-1	SHIELD, Capstan Motor	1	
6	VMG-3	RUBBER SPACER, Motor Mounting	4	
7	VJH-9	TERMINAL PLATE, Capstan Motor	1	
8	DSTBR3-6FY	TAPPING SCREW, 3×6, Phillips	1	
9	P-P4-8FY	SMALL SCREW, Phillips, 4×8	4	
10	P-P4-15FY	SMALL SCREW, Phillips, 4×15	2	
11	SW-4	SPRING WASHER, 4ϕ	4	
12	P-P3-6FY	SMALL SCREW, Phillips, 3×6	1	

NOTE: These pulleys are prepared for securing Tape Interchangeability and should always be coincided with the Capstan Belt (see Page 6). The relationship between the pulley and the belt is as follows;

CAPSTAN BELT USED	PULLEY USED			
	NV-1020		NV-1020E	
	Symbol	Parts No.	Symbol	Parts No.
VDV-1	A'	VDP-28	D	VDP-25
	B'	VDP-29	E	VDP-26
	C'	VDP-30	F	VDP-27
	X	VDP-31		
	Y	VDP-32		
VDV-7	I	VDP-39	L	VDP-42
	J	VDP-40	M	VDP-43
	K	VDP-41	N	VDP-44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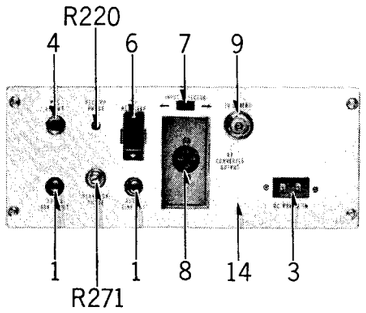


Fig. 1 VEJ-5

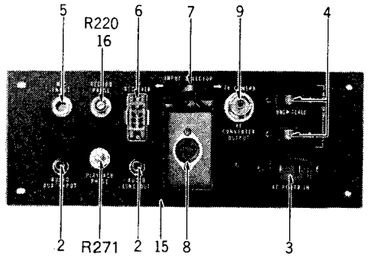


Fig. 2 VEJ-3

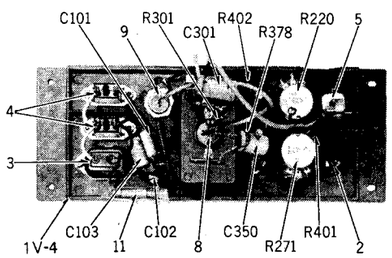


Fig 3

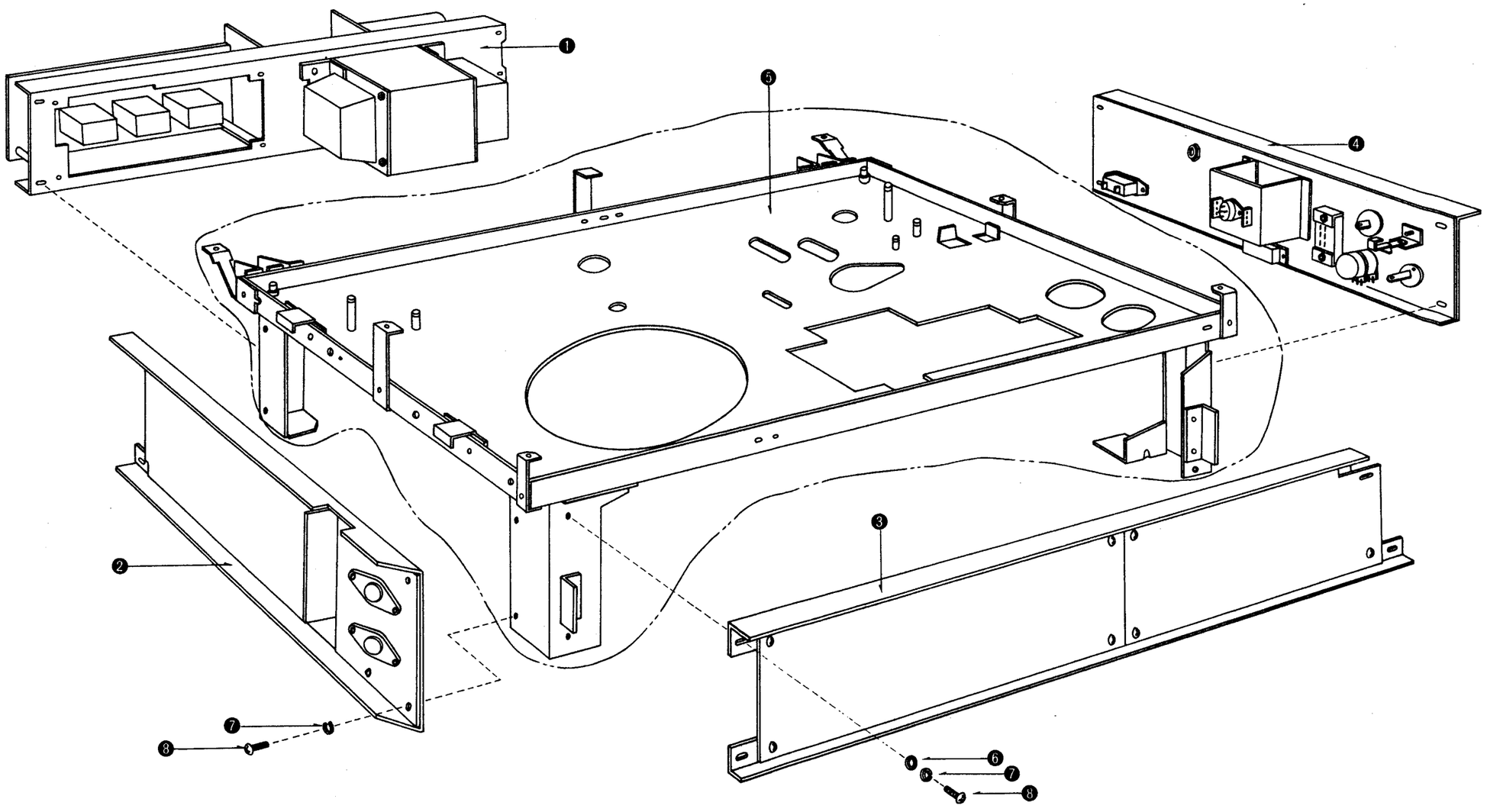
IV. P.C.B. Assembly & CHASSIS

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
1	VEP-101AK	P.C.B. Assembly, Power Section	1	NV-1020
1	VEP-101EK	P.C.B. Assembly, Power Section	1	NV-1020E
2	VEP-201K	P.C.B. Assembly, Control Section	1	
3	VEP-301K	P.C.B. Assembly, Audio/Video	1	
4	VEJ-3	JACK PANEL Assembly *	1	NV-1020
4	VEJ-5	JACK PANEL Assembly *	1	NV-1020E
5	——	CHASSIS	1	
6	W-3	FLAT WASHER, 3ϕ		
7	SW-3	SPRING WASHER, 3ϕ		
8	P-P3-8FY	SMALL SCREW, Phillips, 3×8		

* Remarks: JACK PANEL Assembly is broken down into separate parts as follows.

JACK PANEL Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	NV-1020	NV-1020E
IV-4	VEJ-3	JACK PANEL ASSEMBLY	1	O	×
IV-4	VEJ-5	JACK PANEL ASSEMBLY	1	×	O
1	VJJ-2	PIN JACK, w/Base	2	×	O
2	VJJ-3	PIN JACK	2	O	×
3	VJP-6	PLUG, AC Input	1	O	O
4	VJS-9	SOCKET, AC Outlet	2	O	—
5	VJJ-1	MIC. INPUT JACK	1	O	O
6	VJS-1	SOCKET, VTR-TV	1	O	O
7	VSS-1	SLIDE SWITCH, TV-CAMERA	1	O	O
8	VJS-4	SOCKET, RF Output	1	O	O
9	VJS-1002	VIDEO INPUT JACK, Camera	1	O	O
10	VSF-10A	FUSE, 1.0 A	1	×	O
11	VSF-20A	FUSE, 2.0 A	1	O	×
12	VJH-1L2P	TERMINAL PLATE	2	O	O
13	VJH-1L3P	TERMINAL PLATE	1	O	O
14	VMK-6	JACK PANEL	1	×	O
15	VMP-9	JACK PANEL	1	O	×
16	VDB-23	CONTROL COVER	1	O	—
R220	EVCAOAS10A54	VARIABLE RESISTOR, Record Phase	1	O	O
R271	EVFS1AL15A34	VARIABLE RESISTOR, Playback Phase	1	O	O
R301	ERD-14TK101	CARBON FILM RESISTOR, ¼ W, 100Ω	1	O	O
R378	ERD-14TK750	CARBON FILM RESISTOR, ¼ W, 75Ω	1	O	O
R401	ERD-14TK334	CARBON FILM RESISTOR, ¼ W, 330 KΩ	1	O	O
R402	ERD-12TK105	CARBON FILM RESISTOR, ½ W, 100 KΩ	1	O	O
C101 C102	ECN-U6102M	ELECTROLYTIC CAPACITOR, 600 V, 0.01μF, ±20%	2	O	×
C103	ECN-U6103M	ELECTROLYTIC CAPACITOR, 600 V, 0.001μF, ±20%	1	O	O
C301	ECE-B6V470	ELECTROLYTIC CAPACITOR, 6 V, 470μF, $^{-10}_{+150}$%	1	O	×
C301	ECE-B15V500	ELECTROLYTIC CAPACITOR, 6 V, 500μF, $^{-10}_{+150}$%	1	×	O
C350	ECE-A3V470	ELECTROLYTIC CAPACITOR, 3 V, 470μF, $^{-10}_{+150}$%	1	O	×
C350	ECE-A3V500	ELECTROLYTIC CAPACITOR, 3 V, 500μF, $^{-10}_{+150}$%	1	×	O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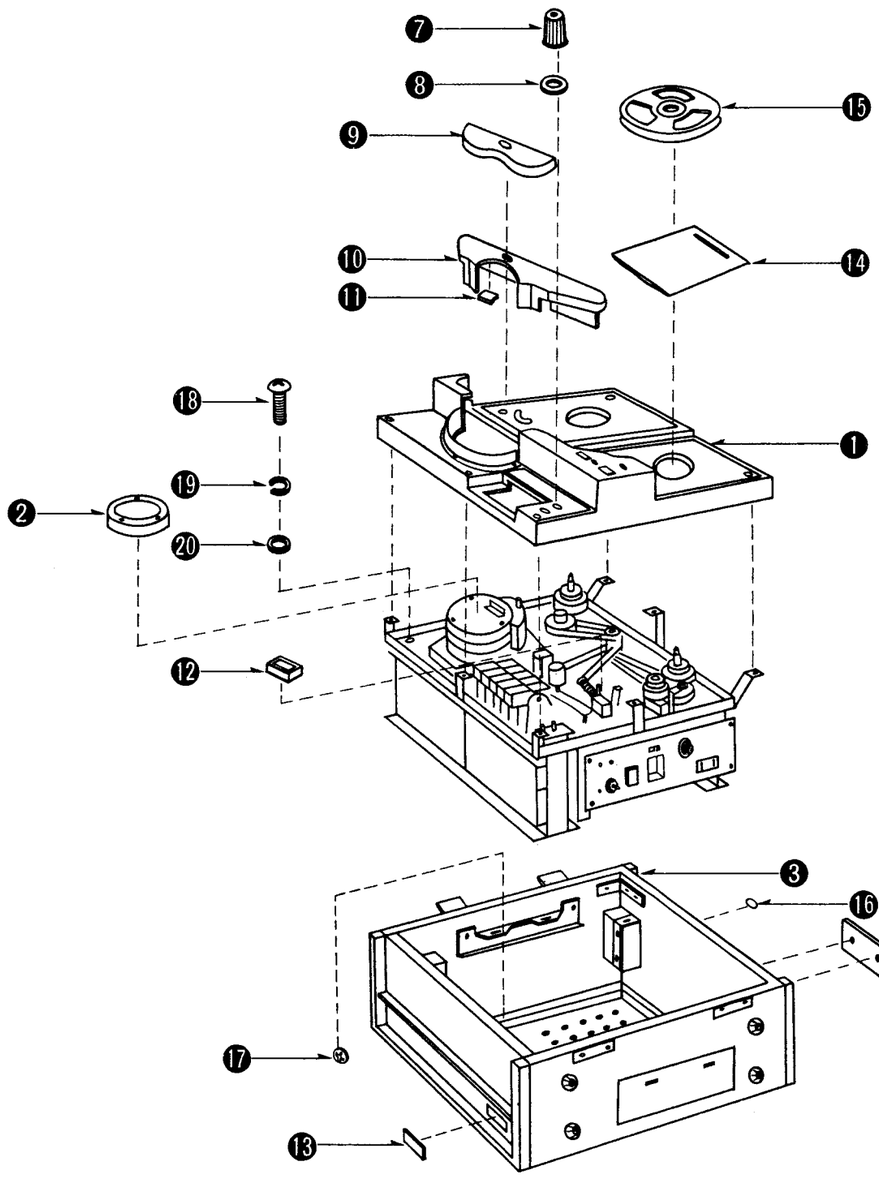
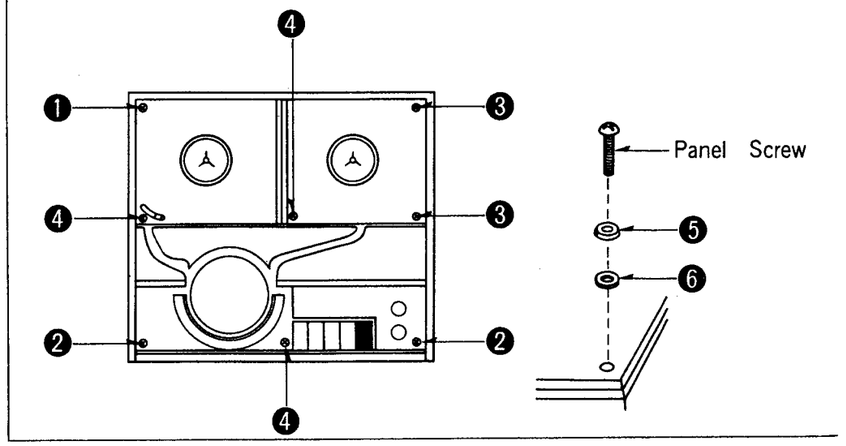
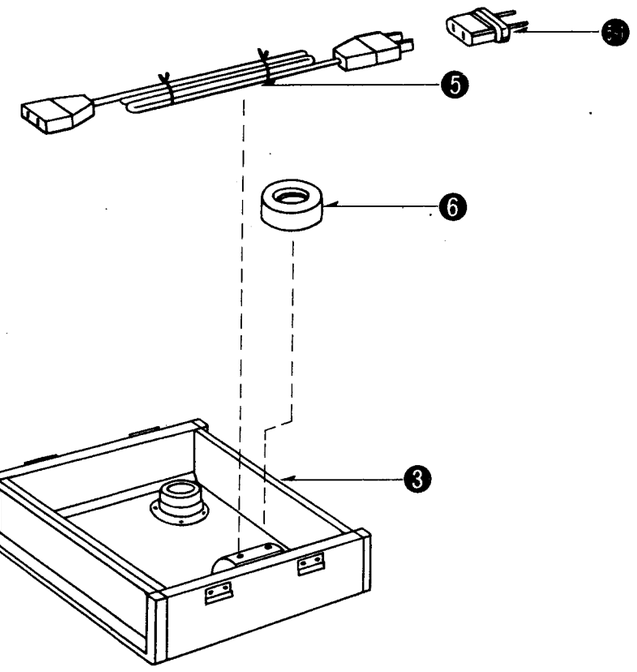
IV-5. CHASSIS Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
1	VXK-6S-6	CHASSIS	1	
2	VMA-13-1	CHASSIS SUPPORTER-D	1	
3	VMA-14-1	JACK PANEL SUPPORTER-A	1	
4	VXA-9-1	CHASSIS SUPPORTER-B	1	
5	VMA-12-1	CHASSIS SUPPORTER-C	1	
6	VXA-10-1	CHASSIS SUPPORTER-A	1	
7	VDB-21	BUSHING, Chassis	2	
8	VMG-2	RUBBER SPACER, Chassis	2	
9	VMP-1	BUSHING, Wiring	1	
10	P-P3-8FY	SMALL SCREW, Phillips, 3×8		
11	SW-3	SPRING WASHER, 3ϕ		
12	W-3	FLAT WASHER, 3ϕ		



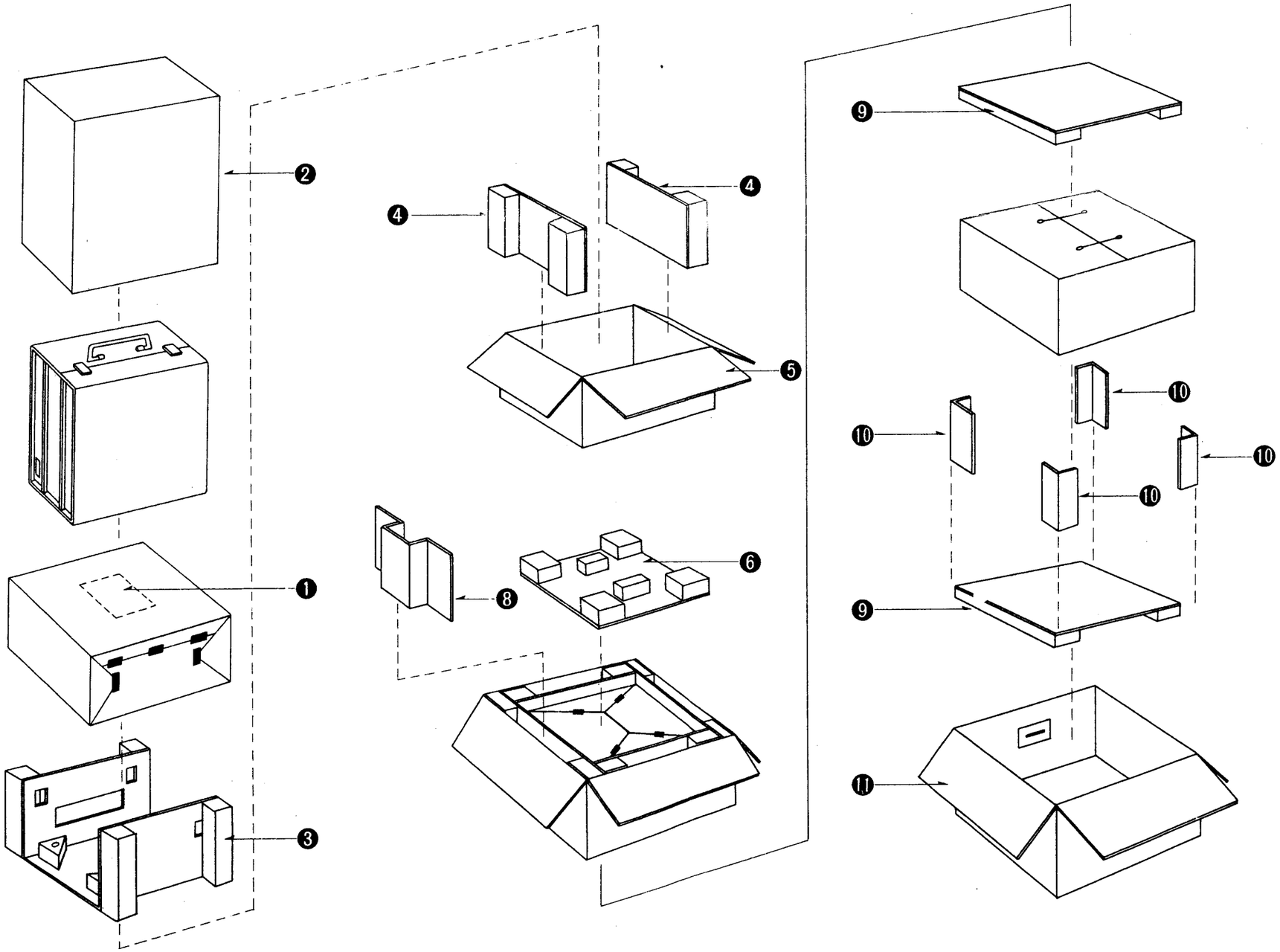
PANEL SCREW LOCATIONS DIAGRAM





V-1. TOP PANEL Assembly

REF. NO.	PART NO.	DESCRIPTION	PER SET	REMARKS
V-1	VYP-2-2	TOP PANEL Assembly	1	
1	VGP-1B-2	TOP PANEL	1	
2	VGK-4	REEL PLATE, Supply Side	1	
3	VGK-2	REEL PLATE, Takeup Side	1	
4	VGK-1	OPERATION PANEL	1	
5	VGF-2B-1	PROTECTOR, Tape Guide	1	
6	VGL-1	LIGHT COVER	1	
7	VGA-1	GUIDE, Tape Threading	1	
8	P-P2.6-6BC	SMALL SCREW, Phillips, 2.6×6	3	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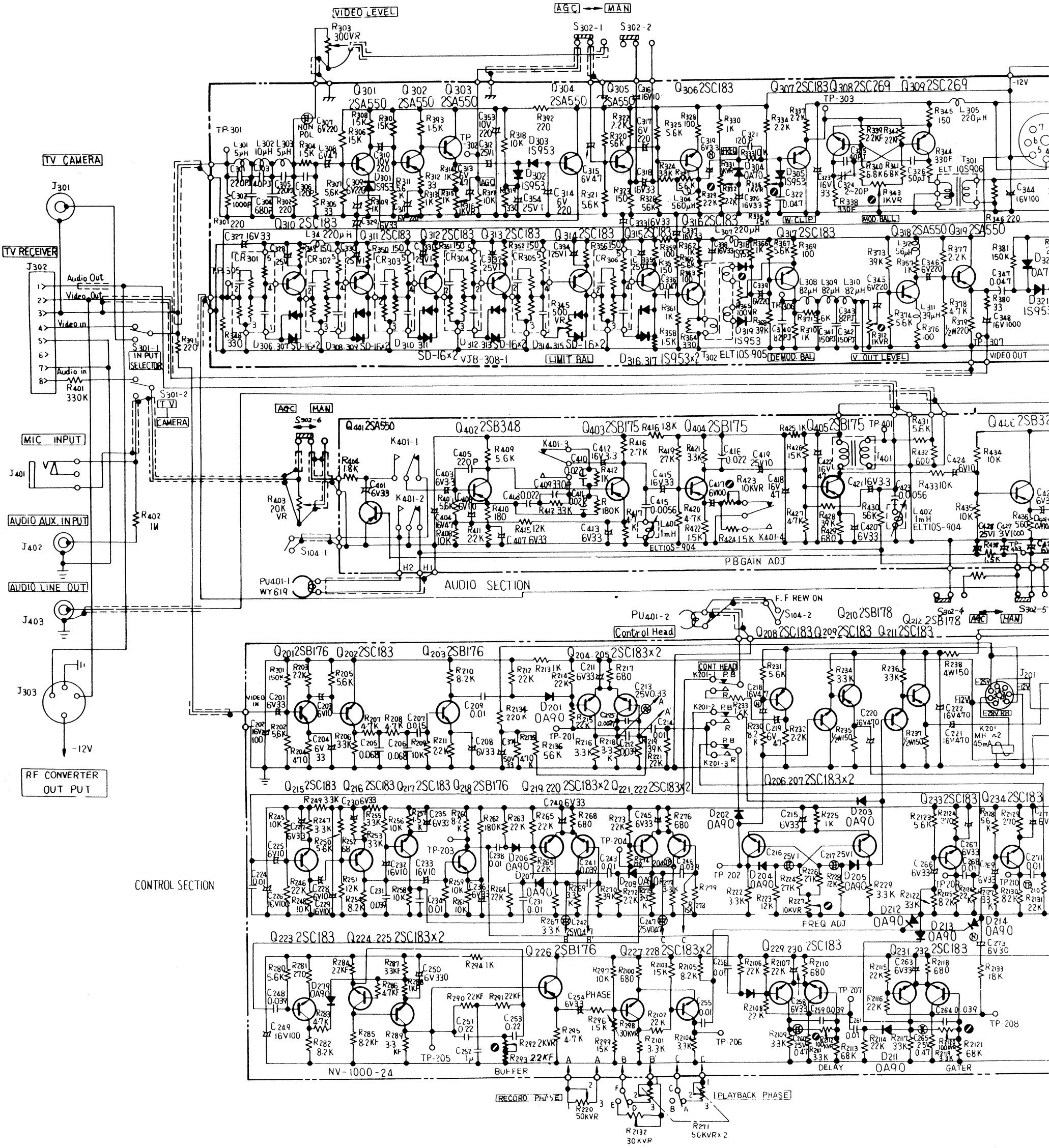
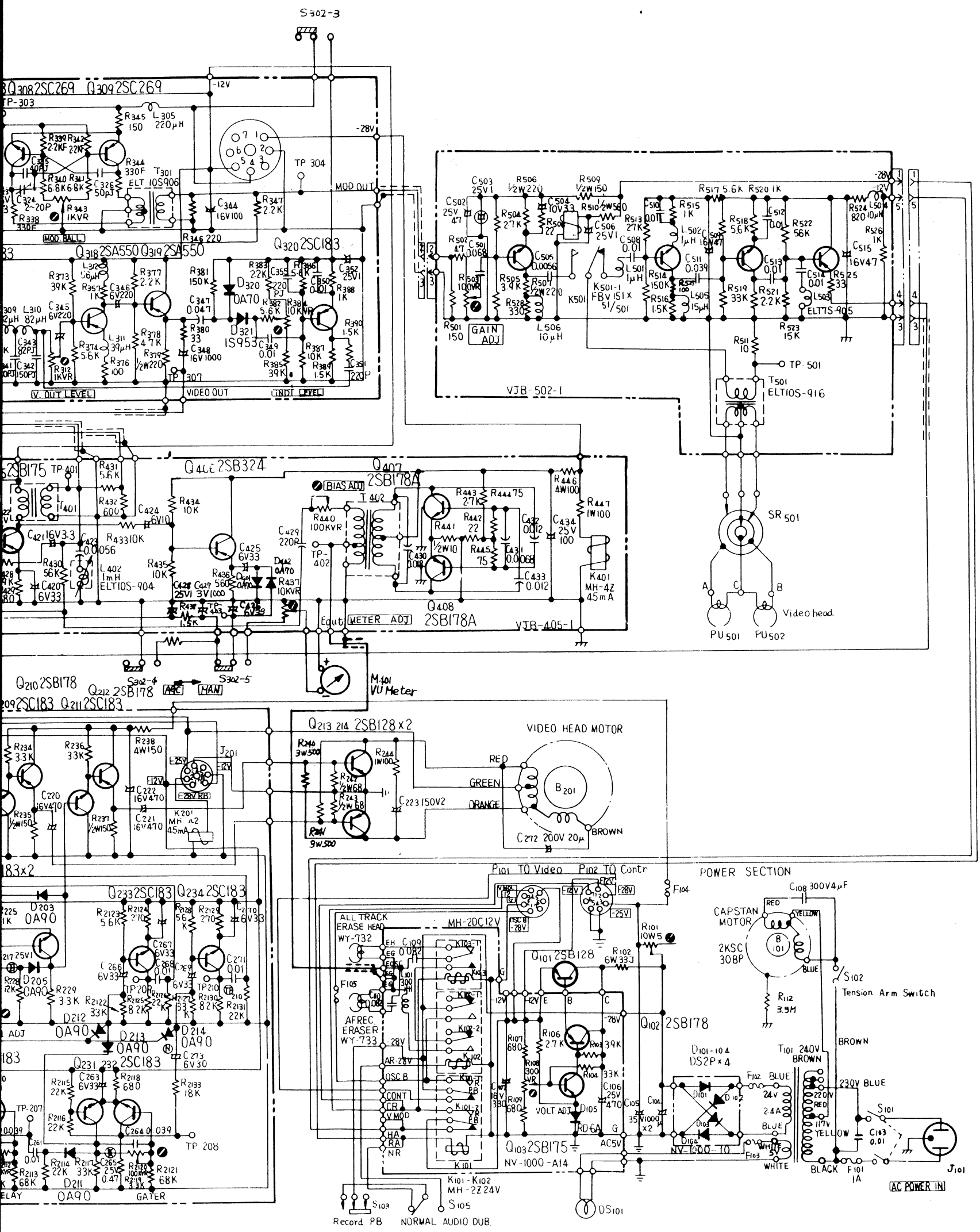
SCHEMATIC DIAGRAM With Automatic Level Contro



matic Level Control **MODELS: NV-1020E**
NV-1020E-1



REMARKS

1. Resistance without specification are in terms of Ω K 1000Ω.
2. Wattage of resistances without specifications in 1/4 W
3. Allowance without specifications in ±10%, F ±1%, J ±5%
4. Capacity of capacitors without specificatins in terms of μF, P: μμF
5. Solid Aluminum capacitor
6. Sem.-Solid adjustment resistors.
7. Printed circuit boad
8. TP Test point
9. S101 Power switch of R403 20K VR
10. S102 Autonatic stop switch.
11. S105 Audio dubbing switch of R302 300Ω VR
12. Complex component